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### Public Building Maintenance and Rehabilitation

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# Public Building Maintenance and Rehabilitation

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**Abstract.** *The public buildings such as high schools, kindergartens, nurseries, universities, dormitories and buildings in their service used by the general public are valuable assets, normally built with substantial investment in a long period of time. These assets are not always managed with the care that they require. As a result, depreciation and destruction in time reducing the ability of these buildings to fulfil their functions by reducing the time of use, durability. General usage costs will also be higher because of the buildings require costly renovations or replacements of materials frequently than might be necessary if they are maintained regularly. Limited funds are often considered as a reason for inadequate maintenance. Enough funds are needed, but very good results can be achieved with very limited budgets, if maintenance work is done in a systematic way with well-defined priorities. The paper tries to answer the question if the maintenance and rehabilitation of the existing public buildings is the most effective way for the improvement of their contemporary standards.*

*In the first part after the background a theoretical description of the building performance management, maintenance and rehabilitation issue. A brief description of the building deterioration and depreciation is done.*

*In the second part the performance the public buildings situation in Albania is given throw analyses of a big number of key studies. Analyses of the cons and pros of rehabilitation are followed by the analyses of costs and the feasibility. In the end is given the answer to the question: to rehabilitate or build*

**Keywords:** *maintenance, rehabilitation, public buildings*

## 1 Damage and deterioration of buildings

The Buildings start being damaged since the moment of their construction due to countless exposure to natural agents as well as by public usage. The influence of natural factors varies depending on climate, design, raw construction materials and professional standards. Hypothesis on damage assumes that buildings conditions tempt to deteriorate in time if they're left untreated. The damage goes side by side with deterioration. However, the last is more unforeseeable and difficult to be controlled even via rehabilitation than the first one. Maintenance and adaptation is needed to fight the damage and deterioration of the building. Continuative economical, demographical changes, as well as technological developments are factors that increase the risk of deterioration of many school buildings. The construction of flexible buildings is a necessity to fight early emerging of this problem both in new buildings and those adapted too. (Ashworth , 1999).

The hypothesis that physical conditions of buildings deteriorate with the passing of time is practicable.

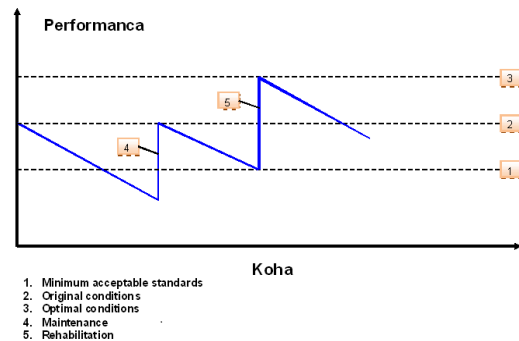
The original structure performance will depend on two factors since the moment of its construction.

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<sup>83</sup> Plani zhvillimor komunal Rahovec (Municipal development plane Rahovec), p 18

1. Surrounding environmental influence. The damage of building structure is connected with one of three main causes: humidity, decay and yielding. All buildings in small or large scale are exposed to these three factors. There are a number of branches in each of these three factors such as: Condensation (humidity), wood rotting (decay), collapse, yielding (move). These factors influence especially the external part of the building, but finally they threaten its internal part, too.
2. User's activity (usage influence). This factor influences the internal part of the building but it could threaten the external part as well. The lack of maintenance, e.g., will inevitably affect negatively external conditions of the building.

In school buildings context, energy enabling to increase building's longevity is maintenance and rehabilitation. These are two main interventions aiming at fighting damage, depreciation and aging.

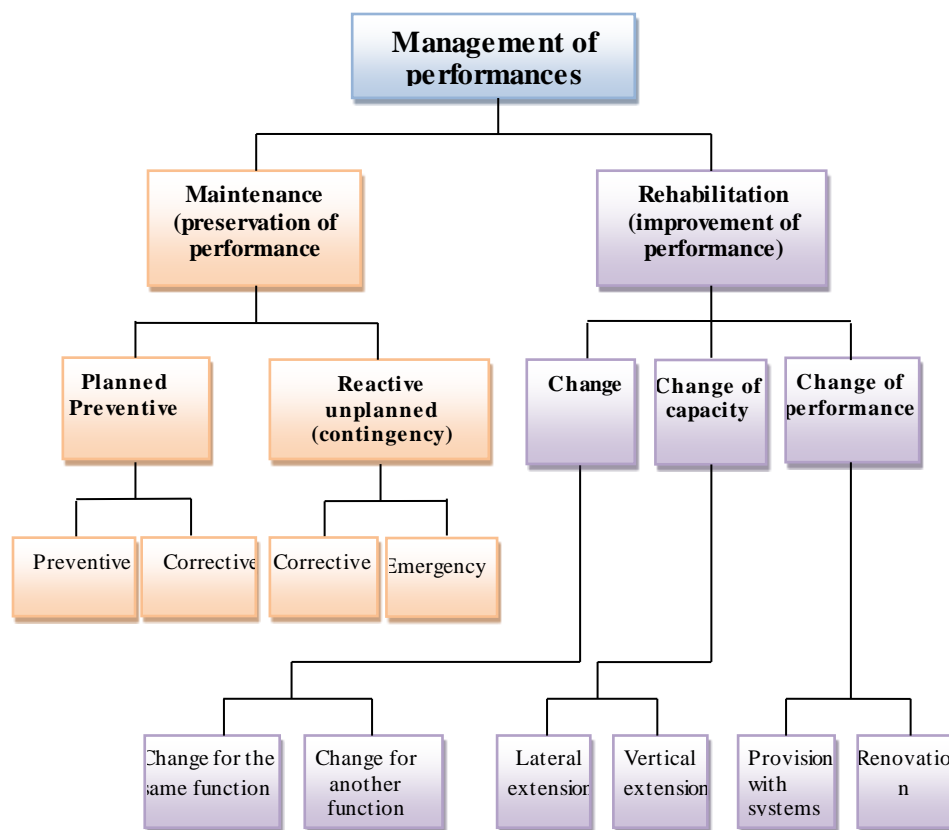


**Figure 28:** Maintenance and rehabilitation influence in performance enhancing (Douglas, 2006)

## 2 Performance management of buildings

The concept of performance, used in construction industry since '70<sup>s</sup>, is systematically based mainly on defining and achieving the desired results focusing on the intent of usage more than in manners (Douglas, 2006).

Maintenance is one of the key elements of buildings performance management. The other element is rehabilitation. The usage of the origin of a building could be prolonged for decades through maintenance and rehabilitation combination.



**Figure 2:** Performance management (adapted by Henket, 1992)

## 2.2 Maintenance

By maintenance we will understand the act of maintenance of the building in a pre-determinate state. Maintenance including reconstruction which constitutes work done to return certain parts of the building in their original state, it is also called the act of substitution of destructed parts. Maintenance and reconstruction can be enlarged including small interventions to obtain improvements thanks to services of accepted high level standard but that do not include rehabilitation.

### 2.1.1 Types of Maintenance

There exist two types of maintenance: Preliminary (planned) and reactive (unplanned) maintenance.

Preventive planned maintenance is naturally more expensive than unplanned maintenance. The last should result in costs of long term for buildings maintained in this manner (Chanter and Swallow, 1996; Wordsworth, 2000).

Even in preliminary planned maintenance of a school building, performance will decrease inevitably. Acceptability of decreasing performance in time, however, is not influenced only by the level of maintenance of the building. This depends also on the standards defined by central government, local government and users of the building or through the legislation/regulations into force, especially concerning the way of exit, access of people with disabilities, health and safety, etc..

### 2.1.2 *General considerations on maintenance*

Why is the maintenance of buildings necessary ?

Bad maintenance of school buildings will interrupt the fulfilment of those functions they are built for. Their deterioration begins at the moment of construction. If certain materials are damaged or destructed, they will eventually affect other components of the building. These damaged or deteriorated components should be repaired otherwise the capability of the building to protect students from natural hazardous events, to keep equipments safe, etc., is compromised.

Regular maintenance, repairing cracks at the moment when they are still small, constitutes the most effective strategy related to costs to ensure the well functioning of buildings and the reduction of operative costs.

Buildings which are not maintained have do not a long life. Maintenance will prolong their use almost indeterminately. Substitutions will be rarely, resources will be preserved and the environment, too. Building's maintenance enables managers to prolong the life of existing buildings by moderate recourses compared to substitution costs.

A poorly maintained building also constitutes a poor job environment, which could limit the motivation of pedagogic staff for work. At the same time poor maintenance is often subject to people's doubts related to teaching quality carried out by a school institution. But, maintenance is not automatically a condition of creating a good job environment. Additionally, maintenance helps improving the conditions that are not so comfortable or directly harm staff and students as well as essential equipments for a more effective and kind job environment.

### 2.1.3 *Public building maintenance and attitude towards it*

Usually, poor maintenance is result of lack of clear policies. Elected officials and politicians sometimes are not forward-looking and fail in giving priorities to those unprofitable activities when the next election's date is coming near.

Decision-makers or planners often do not pay so much attention to the management of public buildings. This could happen due to the fact that they are not aware of the financial costs derived by improper care of public buildings.

Local managers of educational services are also protectors of big and valuable assets of public real estates. But, they have rudimental competences in building management at local decision-making structures. Building's inventory is not managed professionally and the necessary priority that brings out numerous and unneeded operative expenditures and low standards of buildings is not given to maintenance. Improvements on large inventory management of public buildings could bring large savings of money.

Through trainings engineers and local governors as well as relevant Ministry staff are mainly more oriented toward reconstructions or new buildings. Maintenance is often defined as an addition or prolongation of the original building, which should be done by professional construction staff by tendering it to different companies.

Maintenance would be less expensive if it is done continuously and in a decentralised organization. Tasks related to maintenance of existing completed buildings, and other routine activities do not require special technical abilities, e.g.: general cleaning, cleaning of white waters drains and manholes, cutting of shrubs and trees. Other tasks related to maintenance could be executed by a half-specialised staff or by local master builders with basic professional skills such as: repairing roofs from leaks, repairing and reinforcement of locks and hinges, substitution of seals and valves, substitution of casement of the windows.

Maintenance staff and other users would be useful by carrying out soft tasks, permitting the specialized staff to be concentrated in intervenes which require their professional skills.

Professional and assistant staff who use public buildings often think that maintenance is not

part of their job and they are not requested to do anything even when this affects them directly. This attitude has the origin from the fact that public buildings are government's property both at local and central level. This behaviour makes people pay less attention to them compared to their houses and properties, and often leads to abuses and vandalisms or damages of buildings and properties of public schools. If users will perceive themselves as co-owners of their institutions, damages caused by usage will be profoundly reduced. At the same time profits will come to users who participate actively in well-maintaining of their buildings.

#### **2.1.4 *Legislation and regulations***

#### **2.1.5 *Assessment of damages***

##### **2.1.5 *Financial aspects***

- Basic project of the building, materials used and construction standards
- Type and complexity of technical installations, such as hydraulic, electric, ventilation, cooling and heating equipments, elevators etc.
- Climacteric conditions
- User's conditions
- Standards of desired maintenance
- Organization of maintenance

0.5-3% of the value of the substitution of existed building (Carlqvist, 1997).

##### **2.1.5 *Funds provision***

#### **2.1.5 *Funds distribution***

## **2.2 *Rehabilitation***

(Heritage Canada Foundation 1983).

(USA Secretary of The Interior's Standards for Historic Preservation 1979).

1. Energy efficacy
2. Increase of comfort conditions such as acoustic, safety and quality of air, by installing a better finishing and services that react slighter.
3. Improvement of fire protection
4. Increase of sustainability (improving of walls and/or roof, terrace)
5. Access

### 2.2.1 Reasons on rehabilitation of public buildings

In spite of economic and legal developments there are some other reasons for the rehabilitation of public buildings instead of their construction as new ones. These reasons are:

*Financial aids existence.* Concerning school buildings, financial aids are available to relevant Ministries, local governments, financial organizations, donators, foundations, etc.

*Time of construction* Rehabilitation is faster than construction as a new one.

Intervention on **damages Rehabilitation** to interrupt building's damages caused by a number of causes is needed. Rehabilitation would prolong the economic and services life.

*Efficacy (performance).* The need to increase acoustic and thermal performance as well as the structural sustainability of the building is a reason for rehabilitation interventions. The consumption of a large amount of energy leads to the need of rehabilitation which includes the renovation of heating system and improvement of thermal insulation of the building.

*Usage changing.* When the building is not in line with markets requests and it has lost its original function there is a need to adapt it for the same use or for a new use in order to assure prolonging of building's life.

*Legal restrictions.* Legal restrictions related to the impossibility of changing the destination for public use of a school building could lead to the rehabilitation of existed building for the same or for a new use.

*Preservation of architectural and historical values.* Cultural values as well as technical reasons influence the decision for the rehabilitation of a school building instead of a new building. Architectonical or historical value of the building could possibly be a sufficient reason to preserve it.

*Environment preservation Rehabilitation* or renovation of old school buildings is friendlier with the environment more than reconstruction. The last involves the destruction and construction of a new building which together spend more energies and waste than rehabilitation.

### 2.2.2 Advantages

*Economical Advantages.* It is less expensive to rehabilitate an existing school than to destroy and redevelop the ground by rebuilding it. Rehabilitation is faster than rebuilding a new one. The existing infrastructure is ready to be used (foundations, main services and superstructure). Consequently the period and cost of construction are quite free.

Additionally, rehabilitation does not include the massive destruction of the building which itself is very expensive. By destroying the buildings there are generated harmful materials and the contamination of the ground, thus increasing the costs.

*Technical Advantages.* The existing structure of the building could be used integrally. The building needs to be modified in order to fulfil needs for proposed work of rehabilitation. Much of the existed equipment in good work conditions could be reused again.

*Spatial Advantages.* Surface of exploitation of the ground for the construction of a building can be smaller than the existing structure. In this case maintaining the existing structure could be reached a maximum profit of surface in contrast with the case of building a new one which should respect urban conditions of urbanity regulations and those of the municipality (line of construction, coefficient of exploitation of terrain).

*Environmental Advantages.* If the project is well-done and successful, a better view can be reached on the school building rehabilitated. In this way the building will have a positive effect related to surroundings as well as the deserve prestige. Additionally, rehabilitated building will be more efficient concerning the preservation of energy and more economical in use.

Rehabilitation is an important criterion related to sustainable development. This is because it reduces the consume of energy and production of wastes. It minimizes the need to use new

material sources and the necessary energy for their production and transportation. Thus, the energy needed and that of transportation consumed is much lesser than building a new structure with the same size. Besides this, rehabilitation minimizes pollution and waste, due to the fact that it avoids destruction.

*Social Advantages.* Preservation of the street character and block of dwellings is achieved better via rehabilitation of school buildings. Old buildings offer psychological safety and prestige due to their special characteristics. Rehabilitation of buildings of this category provides architectural, cultural and historical profits.

It is not easy to measure social benefits of rehabilitation. A successful rehabilitation of a school building with architectural and historical importance could offer hope and the lost prestige of a community. Rehabilitation of school buildings could result in health benefits for their students. It could help arresting humidity and low quality of the air which together have a great influence on building's diseases.

### **2.2.3 Disadvantages**

Not all rehabilitation interventions on school buildings result convenient. In some cases those would result unsuccessful because the modifications in buildings were inappropriate or of low quality. Some old or abandoned buildings are better to be destructed to open the way to appropriate and attractive buildings.

Principal disadvantages of rehabilitation are:

*Functional Disadvantages.* There is no insurance that an existed school building rehabilitated will reach the performance of a new school building. Restrictions related to plan and height could compromise the achievement of user's needs. Additionally, if the form, scale and view of the building have been defined primarily, the project of renovation is considered more problematic than a new building. Rehabilitation of an existed building could impede the effective use of the ground.

*Economical Disadvantages.* Maintenance costs of a rehabilitated school are usually higher than a new building. Additionally, energy costs are higher and it is more difficult to reach standards of isolation of new buildings. Requests on preservation of old buildings in rehabilitation work could increase the construction costs which could reach that of a new building.

*Environmental Disadvantages.* Not all rehabilitated buildings result in improvements of internal and external environment. The view or energy efficacy consummation in rehabilitated buildings couldn't possibly be better than that of a new building. Usage could not be in line with surroundings in terms of density or nature.

*Legal Disadvantages.* Some of old buildings do not permit to match completely the requests of construction regulations. Spatial and structural restrictions in some of these buildings could impede implementation of requests related to emergency exits and fire resistance. Project restrictions could limit the scale in which the building could be rehabilitated. This will affect the good progress of the proposal.

### **2.2.4 Rehabilitation costs**

From the experience gained up to now, the rehabilitation of old school buildings, in cases when their skeleton is relatively healthy, reflects a lower cost of intervention compared with that of a new building. According to Alfred Fisher (2000) with the rehabilitation of existed buildings we have savings at 20-40% of the value of a new building. But, we should take into consideration that the value of rehabilitation depends on a number of factors which decrease or increase the



real value of costs. If the rehabilitation cost exceeds 75% of the value of a new building it is advisable a new building (BMI, 2005).

Preliminary preventive of rehabilitation costs during the project is very difficult. This derives from the impossibility of calculation of many processes of work. Many additional unforeseeable work comes out during the implementation of the project. As consequence the preventive of costs can be done by a fluctuation of  $\pm 25\%$ . In our country for such kind of work it is left a reserve of 15-20% of the value of the building (Nepravishhta, 2001). Calculations are based on the surface of construction ( $m^2$ ) in calculating the costs of rehabilitation. This is because the adaptation costs are not in a direct relationship with the volume.

### **2.2.5 Financing**

Rehabilitation and renovation financing of school buildings in our country is done mainly by funds from the state budget which are given to the Ministry of Education and Sciences as well as to local governments.

Other financing resources are different funds of foreign financial organisations, donors, various associations, etc.

If it is impossible to have access in state aids for rehabilitation operations, fiscal facilitations should be allocated.

### **2.2.5 Feasibility**

In school buildings rehabilitation project feasibility is a crucial element to be taken into consideration. In this context it is related to three main factors:

1. Convenience (economic feasibility)
2. Practicability (physical feasibility)
3. Usage (functional feasibility)

Among these three factors the most important is the economic feasibility, followed by practicability and usage.

Each assessment of a rehabilitation feasibility scheme should be compared with the potential value of foreseen costs. Thus, if the value of the estimation of rehabilitated building is bigger than the value of the existed building, the proposed scheme should be considered as immediately feasible in terms of financing. But, the best way to compare estimated costs of rehabilitation is by comparing them with rebuild costs. The last should include the destruction costs of existing building as well as the costs of construction of the new structure. Destruction costs will increase a lot the costs of the rebuild project if the building to be destructed is of difficult construction as well as when it is constructed with harmful materials against health (such as eternity covers, etc.).

Main quantitative and more realistic method which compares rehabilitation costs with rebuild ones is rehabilitation costs as percentage of construction costs. Based on data of Ministry of Education and Science rehabilitation costs of schools compared with their rebuilding varies from 50% to 70%. Based on Building Cost Information Service (BCIS) (2005) which analysed contracts of 2550 projects, average cost of rehabilitation of schools compared with rebuilding was 62%.

What would be the limit value of rehabilitation costs of a building compared with rebuilding costs? To this question we'll answer knowing the fact that the average costs of rehabilitation of buildings are medially as  $2/3$  of the cost of building of a new structure. In case of school buildings, if they do not last more than 20 years and the cost value of rehabilitation overpasses 75% (BMI, 2005) of the value of the construction of a new building, rehabilitation is not feasible and it is recommended the construction of a new building.

## 1 Conclusions

Taking into account the abovementioned, conclusions are as follows:

- Pressures for further maintenance and rehabilitation of existing buildings are increasing in our country as a debt to be paid for the needs of development for a more effective and sustainable construction . Rehabilitation and maintenance of buildings are a crucial component of every strategy of sustainable development. Both are essential to assure a long term welfare of construction fund.
- Maintenance and rehabilitation of public buildings enable users to prolong life of the existing buildings with moderate sources compared to the substitution costs. Moreover, maintenance and rehabilitation generate lesser energy and wastes than the construction of a new building and could offer social benefits preserving reference familiar points giving them a new life contract.
- Rapid economical, demographical and technological changes in our country are increasing deterioration risks of many public buildings supporting their rehabilitation. Deterioration is much more difficult to be managed than damage even through rehabilitation. The design of flexible buildings is necessary to fight emerging of this problem both in new buildings and in those rehabilitated.
- If by maintenance the building preserves its existing state, rehabilitation realises its evolution which is a process that enables vital services of the building to be preserved at the same state as well as to be enlarged if necessary.
- Enhancement of the importance of sustainable development should also lead to the modernisation of public buildings. Rehabilitation of existing buildings is a chance to enhance and modernize not only the view of buildings but also all technical performance (energy consumption should be reduced if costs of use are to be faced). These buildings should also be rehabilitated to respond to disabled persons needs in order to have access and not to be discriminated concerning education.
- The decision to rehabilitate or to rebuild (i.e., to destruct and rebuild) a public building should be defined mainly based on economic convenience of these two options. The potential value of adapted building should also have certain relevance in adapting all rehabilitation schemes proposed. Other influences of legal restrictions are part of the game, but firstly, and maybe definitively financial assessment will be crucial.
- In case of school buildings, if they do not last more than 20 years and the cost value of rehabilitation overpasses 75% of the value of the construction of a new building, rehabilitation is not feasible thus, the construction of a new building is recommended. This is not done in the cases when the building is in the list of cultural monuments because of its architectonical and historical values.

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