



Guidelines of Green and Environment friendly building for the state institutions

**Ministry of Mahaweli Development and
Environment**

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Introduction

01. Humans started building houses basically as a mean of protection from various environmental complications that were challenged for their survival. This survival strategy had been later developed to provide them with safety, comfort and social recognition which finally became as an asset to them.
02. Sri Lanka is blessed with minimal hostile climatic conditions and natural disasters owing to its geographical location. Our ancestors had their own architectural models for designing of houses that are suit to the tropical climatic conditions which replete with round the year sunlight, slight temperature fluctuation and seasonal rain falls. However this had been changed after the foreign invasions that was occurred in the 16th century
03. A plethora of environmental, economic and technical issues have been arisen owing to the limit of sunlight through switching into artificial methods of reducing heat such as air conditioning. Most of the modern buildings are being designed with foreign architectural influence and technology which disregard the tropical climatic conditions of Sri Lanka,
04. This situation today has been evolved into a global problem and therefore construction of buildings in order to ensure the sustainability of the planet for the future generations and the efficient use of natural resources have been identified as an area to be addressed on priority basis in order to avoid the harmful effects surfaced as a result of this paradigm shift. The new concept of green buildings was emerged all over the world as a sustainable method of constructing buildings to deviate from the existing environmentally harmful construction practices.
05. Buildings which are constructed applying environment friendly methods and using environment friendly materials, utilizing energy and other resources in efficient manner are defined as green buildings. Technically, if any building in its life cycle from preliminary planning, operation, maintenance and until demolishing uses resources environment friendly and sustainable manner can also be called as a green building.
06. The concept of sustainable development which was introduced to the world in 1992 propagated the use of limited resources sustainable manner in order to conserve them for future generations without putting them into jeopardy. As an extension to this concept, the green concept was introduced in 2010 and the objective of that was to keep the global temperature at bay by reducing the emission of greenhouse gases through minimizing of environment pollution and using of resources in efficient manner. The 12th item of the sustainable Development objectives which has been endorsed in 2015 deals with sustainable consumption and production and has been incorporated to the 'Green Concept'.

07. Guidelines on green buildings are key components in achieving the goals of sustainable development. A thorough study has to be conducted before preparing guidelines for buildings, because they are constructed by varieties sectors. Since it is a difficult task for such a thorough study in preparing these guidelines, 'buildings in the state sector' were primarily selected as a model to identify the shortcomings in applying these guidelines and also to prepare a set of guidelines for all buildings thereafter. Any building which is built in environment and user friendly manner and having maintained comfort and hygienic condition is also called a green building.
08. These guidelines for green buildings can be applied at all stages of the life cycle of an ordinary government building such as planning, constructing, operating and maintenance, repairing, reconstructing, altering and demolishing. It is not compulsory to apply these guidelines on archeological sites and National heritage buildings declared by the government. However, the application of these guidelines in reconstruction / redesigning of these buildings can be considered or made mandatory upon granting permission by the relevant institutions.

Present situation

09. Buildings of the state institutions in this document mean buildings of fully owned by the government, institutions such as Corporations, Boards, Buildings and affiliated institutions such as universities, state banks and companies.
10. There is no detailed registry of state buildings and details of buildings belongs to the each institution also have not been documented comprehensively. The survey which was conducted by the Department of Census and Statistics in 2012, had covered only population and houses.
11. Accordingly to the aforementioned survey 5,207,740 housing unit had been recorded in Sri Lanka and the majority of houses (598,674) are situated in Gampaha district. Colombo and Kurunegala districts were recorded 562,550 and 445,517 houses respectively. The survey had not covered the government buildings.
12. Tile is the most common roofing material used in those houses (47.6% of 2,479,226 households). 34.6% of Asbestos households (363,413 houses) have been identified and the most number of Asbestos thatched roofs are found in Colombo District. Asbestos are considered as a harmful roofing material having health risks.
13. Energy auditing measures the efficiency of the government buildings. Past records shows that 90 energy auditing were conducted from 2005 – 2015. Most of the details of these audits are mentioned in various institutions separately owing to the absence of a national register on the use of renewable energy, net-metering, and carbon foot print measuring methods.

14. In order to apply the green building guidelines, it is important to have details of government buildings, their constructing material, energy and water usage, carbon footprint and their audits. Therefore, basic requirements related with preparing of guidelines have to be fulfilled following a proper plan and methodology. A plan was developed to be implemented from May to December 2016. Twenty two (22) activities have been included in this plan with establishing of a database after a survey on buildings and building materials produced regionally.

Goals and objectives of green buildings

15. The objective of implementing the guidelines on green buildings is to elevate all government buildings to sustainable and environment friendly level while maintaining safe and comfortable environment for its users.

16. In order to achieve these goals, the guidelines on green buildings may be cited as the short term objectives.

planning, constructing, operating and maintaining, reconstructing, making changes, expanding and demolishing building in a manner that suit the environment;

- a. Using energy, water, land and other resources efficiently.
- b. Promoting the use of renewable energy and alternative resources.
- c. Promoting the use of environment friendly materials in all matters relating to construction of buildings.
- d. Enhancing the health and comfort of users.
- e. Minimizing related environmental problems in order to reduce harmful impacts to environment and be resilient to disasters.
- f. Protecting cultural and heritage identities.

Principles

17. Activities to achieve the above objectives in optimal levels should be carried out according to the following principles.

- a. Principles on reducing the use, re-using and recycling.
- b. Principles of good governance (accountability, transparency, participation, consensus, responsibility, efficiency and effectiveness, adherence to rule of law, equality and inclusiveness)
- c. Principles of environment approach
- d. Principles of adaption to effects of climatic change, and mitigation of greenhouse gases
- e. Principles relating to prevention of environment pollution such as “to be borne by the polluter” and “extended responsibility of the producer”.

- f. Precautionary principles of environment protection and conservation.

Guidelines

18. Since there is a need of a general policy for these guidelines, an umbrella policy for the entire “green field” will be formulated in future and all sectors relating to the green concept will be brought under it. At present, there is no such policy or policy components such as objectives, aims and principles. Therefore those components have been incorporated into these guidelines in order to bridge this gap. In preparing guidelines, all fields that fall within the ambit of these guidelines (in addition to technical guidelines) have been identified and categorized in the following manner.

- (a) Policy guidelines
- (b) Technical guidelines
- (c) Legal guidelines
- (d) Economic guidelines
- (e) Socio-economic, cultural and health guidelines

19. Even though it is difficult to identify clear border to categorize guidelines, general guidelines relating to policies of the state sector have been categorized as policy guidelines. Similarly guidelines which have close connection to the technical field considered as Technical guidelines, guidelines relating to matters already governed by the laws and regulations and those requiring legal cover in future are taken as legal guidelines and guidelines relating to economic component and administrative components are called as economic guidelines and component required to implement the green building concept and guidelines that cover sectors such as socio-economic, cultural heritage and health have been categorized as Technical, legal, economic and socio-economic, cultural and Health guidelines respectively.

20. Since guidelines outlined in this document relate to various institutions in varying levels, priorities for guidelines of each field were separately identified by the members of the committee appointed by the Cabinet of Ministers. This prioritization will be extremely important in preparing plans for the implementation of these guidelines selecting relevant guidelines and checking the quality of green buildings.

21. Four stages of the lifecycle of buildings have been identified in order to implement the green building concept. According to the necessity, one of the components out of constructing, reconstructing, changing or expanding buildings should be selected. The code used to identify as to which stage each guideline outlined in this document belong to, is given in brackets at the end of the relevant stage.

- (a) Planning with the surrounding (01)
- (b) Constructing (2.1), reconstructing (2.2) / changing or expanding (2.3)
- (c) Operating and maintenance (03)
- (d) Demolishing (04)

22. An attempt has been made to lineup each set of guidelines according to the above mentioned stages as far as possible. Codes have been used to identify guidelines commensurate with the stages mentioned as above. It is expected to put all codes in future which are impossible to categorize at the moment according to the above stages. Guidelines which are compatible with all stages are marked (5). Guidelines which cannot be clearly categorized for any stage are marked.(6)

23. Policy principles

- i. Planning of government buildings in cities as multi-storey buildings with potentially higher number of stories instead of single storey buildings in taking into consideration of factors such as energy efficiency and their limitations (01, 2.1, 2.3)
- ii. Control the use of asbestos as roofing or ceiling materials in government buildings to the maximum possible level and eliminate the entire use by 2018. (2.1, 2.2, 2.3)
- iii. Refrain from constructing of buildings at places where extremely threatened species of fauna and flora are existed (01, 2.1)
- iv. Buildings should not be constructed as places where species with endemic traits are found or in where these species are limitedly spread. (01, 2.1)
- v. Buildings should not be constructed in places where extremely rare or rare eco-systems exist. (2.1)
- vi. The land on which the building is constructed should not be a land that renders important environmental services or economic services. (2.1)
- vii. As far as possible, minimize or avoid the construction of building where the risk of natural disasters such as landslide may be increased due to construction (2.1)
- viii. It should be encouraged to construct buildings at locations (sites) previously developed for constructing of buildings. (2.1, 2.2)

- ix. All efforts must be made to minimize damage caused to natural environment when constructing of buildings (maximum distance could be harmed from the site is 15 m) (01,2.1, 2.3)
- x. Switching off all electric bulbs except emergency electric circuits (light and sound) fixed in building after office hours. (2.1)
- xi. Promote the use of alternative materials for sand such as thoroughly washed metal dust, desalinated sea sand or discarded wall plaster dust should be used instead of sand in constructing buildings. (03, 04)
- xii. Priority should be given to the projects of reconstructing or rebuilding of existing buildings or providing the opportunity to expand such buildings in order to minimize the need of constructing new buildings. (2.2, 2.3)
- xiii. Use of regionally manufactured buildings materials and products as much as possible. (2.1)
- xiv. Encouraging the use of environmentally polluted lands (brown fields) or abandoned lands through developing them in a manner with intention of developing such environment in order to avoid the use of virgin lands for construction of buildings . (2.1)
- xv. Conduct of Energy Audit and Carbon Foot Print audit for every building once in 3 years in order to enhance energy efficiency (03)
- xvi. Conduct a water usage audit of every building once in 3 years to enhance the efficiency of water use (03)
- xvii. The use of excessive timber in constructing government buildings poses a grave threat to natural forest cover of the country. Therefore in future constructions, methods such as timber treating should be adapted and certificates should be obtained from construction institutions to the effect that the timber used has a life span of at least twenty years. (2.1)
- xviii. Using renewable building and products materials as much as s possible (percentage) (2.1, 2.3)
- xix. Promoting the use of processed and unburnt brick in order to conserve energy. (2.1, 2.3)
- xx. Apply a green procurement process throughout the entire process of purchasing of building materials and equipment that are needed for the building and purchasing of furniture. (2.1, 2.3)

- xxi. In order to minimize environment pollution and land development impacts caused by transportation, plans must be made with minimal distance to mainstream traffic flow and on sharing basis with adjoining buildings. Buildings must be constructed with parking facilities without separating them with walls. (01, 2.1)
- xxii. The distance from preliminary routes, walking tracks and main supply routes must be as minimized as possible. (1.5 m). (01, 2.1, 2.3)
- xxiii. Promoting the recharge of batteries of the electric vehicles from renewable energy sources as much as possible. Further, the users of the building must be given opportunities of recharging the batteries of their vehicles. (03)
- xxiv. Promoting the use of bio gas by service providers such as cafeterias for generating renewable energy and for properly dispose the garbage generate within the building and premises. (03)
- xxv. Using plugs with timers which can automatically disconnect the supply of electricity when not necessary and electronic sensor systems in order to prevent the waste of electricity.(03)
- xxvi. Install taps with sensors which release water only when the hand is directed closer to the tap whenever possible in order to prevent the waste of water (2.1, 03)

24. Technical guidelines

- i. By thatching the roof with environment friendly materials fitted with solar panels avoid the use of harmful substances such as Asbestos. (2.1, 2.2, 2.3)
- ii. Encouraging the use of a concrete slab for the roof of the building in order to minimize the use of Asbestos and to use a space similar in size of the building as an open area. Introduce suitable green cover on top of the slab in order to reduce the penetration of heat into the building along with maintaining proper ventilation within the building.(01, 2.1, 03)
- iii. Design of buildings after thorough study of the wind direction and fixing windows in such a manner so that the building may get optimal level of ventilation in order to reduce the use of Air conditioners. (01)
- iv. Designing of buildings should be done in such a way that the hot air travels up through the void (part that is open to the sky with rain covers), and allowing fresh air to fill the building with natural ventilation. (01, 2.2)

- v. Designing the buildings with techniques that could be adapted to the present environment problems occur due to climate change effects such as floods, droughts, cyclones and rising of sea level. (01, 2.3)
- vi. The level of ventilation within the building must be maintained at optimal level Therefore when designing of buildings, precaution must be taken to ensure that raw materials which in the long term are likely to emit harmful chemicals and dust are not used in the construction. (05)
- vii. Using areas that receive more sunlight for the daily operational needs of the officers (eg. Establishment unit, accounts unit, etc.) (01, 03)
- viii. Proper systems of separating and disposal of garbage must be established in the building. Incorporate places to collect and transport garbage easily in the plan. (01, 2.3, 03)
- ix. In designing all new buildings, at least 25% of total energy requirements must be met with solar energy. For that it is required to cover more than 25% of the roof with solar panels. It is compulsory for buildings with low consumption of energy of thatch 25% of the roof with solar panels so that the energy produced in those buildings could be added to the national electricity grid. (2.1, 2.3, 03)
- x. Renewable energy produced in buildings through the use of solar panels must be connected to the national electricity grid through net metering system. (03)
- xi. Capacity of each Air conditioner used for air conditioning of the building should be operated by air conditioners with zero ozone depleting potential and <700 Global Warming Potential whenever possible. In using Air conditioning systems with over BTU 24,000 in capacity it must be ensured that they are of zero ozone depleting potential and potential to minimize global warming potential. (03)
- xii. If Central Air-conditioning systems are used, it is necessary to use a method to adjust capacity to suit consumption requirement. (2.1, 03)
- xiii. A methodology to maximize the use of water obtained through rain water harvesting systems for flushing purposes of toilets and lavatories must be put in place in buildings. (01, 03)
- xiv. Promoting the use of low water consuming but efficient toilet accessories (2.1, 03)
- xv. Using collected rain water or waste water after treating with high efficiency irrigational technologies, to be used in the garden and for other requirements instead of using drinking water. (03)

- xvi. Implementing a rain water management plan to enhance the use of rain water at least 70% of annual rainfall by reducing the coverage of non absorbing land, promoting absorption and retaining and treating rain water. (2.1, 03)
- xvii. Establishing a rain water treating system for removing (depositing) 50% of the annual residual solid materials. (2.1, 2.3)
- xviii. Preparing and implementing a management plan to reduce the volume and speed of water following to 25% and to face heavy rains with strong winds in a manner that accumulated rain water won't cause any destruction when the amount of absorption of water is over 50%. (03)
- xix. Reduce the use of sand by constructing walls in cement blocks/brick without plastering but with fine finishing or cover the brick wall with a thin plaster with high technical potential and applying a suitable environment friendly paints which are free of heavy metals . (2.1, 2.3)
- xx. During the period of construction, generation of waste, flowing of waste water and strewing of dust should be minimized . (2.1,2.2,2.3, 4)
- xxi. Entertainment and Rest areas must be developed for the users of the building. (01, 2.1)
- xxii. Obtaining at least 2% of daylight for 75% of the total area of the building by avoiding direct sunlight. (01, 2.1)
- xxiii. Using L.E.D. (light emission diode) bulbs as much as possible for lighting purposes of the building. (2.1, 03)
- xxiv. During the period of construction, soil erosion and accumulation of silt in drains should be minimized. (2.1)
- xxv. Using recycled materials and materials discarded after use as much as possible in constructing buildings. (01, 2.1)
- xxvi. Promoting reuse. In order to reduce waste of building construction demolishing or preparing land / promoting saving. (2.1, 03)
- xxvii. Constructing the school buildings or rest houses which are usually of long shape to face west-east so that they won't be affected by direct sunlight (walls without windows face

both directions). The construction of roofs with verandahs on long sides should be promoted in order to reduce heat even further (01, 2.1)

- xxviii. Using discarded, redesigned or reused materials as much as possible as building materials for interior beautification. (03)
- xxix. Attention must be paid to ensure that all types of applications meet personality and safety when planning buildings. (01)
- xxx. Plant trees that are not attractive for harmful creatures, avoid planting invasive plants, toxic plants and various harmful creatures should not be used for landscape designs. (01, 2.1, 03)
- xxxi. In designing landscapes, plants with sharp spikes on leaves should be planted away from the places where users of the buildings move around. (to minimize lightening attacks) (2.1, 03)
- xxxii. In designing landscapes, plant species threatened with extinction, endemic plants and plants that render special environmental services and are connected with conservation of animals must be used as a conservation strategy. (01, 2.1, 03)
- xxxiii. Plant species selected for landscaping designs should not produce either large number of flowers at once or excessive amount of pollen (To reduce pollen) (01, 2.3)
- xxxiv. In designing landscaping at cultural heritage of the area, should be encouraged to use plants species suitable for both soft and rigid landscapes. (01, 2.3)
- xxxv. Not exceeding 80% of the light energy density for light and safety outside the building and not exceeding 50% of the above for the front and landscape area of the building (01, 2.1, 2.2, 2.3, 03, 04)
- xxxvi. Controlling cross environment pollution to avoid pollutants entering to building and to the area which is used by permanent users of the building (2.2, 2.3, 03)
- xxxvii. Development plan of the building (building plan - building area) should be minimized to 25% of the area (01, 03)
- xxxviii. Walking and cycling facilities for the users of the building should be developed. (01, 2.3)
- xxxix. Solar reflection index of roofs with 75% of roof area and low and sharp sliding should be thatched with thatching materials of 78 and 29 of reflection index. (2.1, 2.3)

- Xi 50% of the roof area should be covered with a plant (green) cover. (01, 2.1, 03)
- xl. Implement an inside air quality management plan for construction of the building and thereafter (2.1, 03)
- xli. Minimize of making partitions, which obstruct cross ventilation and only do it if essential. Make as low height partitions whenever possible. (01, 2.1, 2.3)
- xlii. Making building plans which avoid the excessive use of timber and using alternative materials in place of timber.(01, 2.1, 03)
- xliii. Appointing a manager for dealing with green sustainability, energy index and carbon footprint calculation for every institution (for a building on a set of buildings (on requirement). (03)
- xliv. Total amount of energy exhausted for (building energy) operation and maintenance of the building (of one unit of area of the building) should be as low as possible (70 watts for net maximum square metre). (2.1)

25. Economic guidelines

- i. Grant tax concessions for imported items which cannot be found locally and are essential for construction and maintenance of green building. (06)
- ii. Implement a concessionary pricing scheme for encouraging the use of alternative sand and recycled building materials. (06)
- iii. Initiating a scheme for exempting the state corporations which maintain green buildings from taxes (06)
- iv. Promoting programmes of conducting competitions on the green building concept and awarding financial awards and certificates. (06)
- v. Promoting the availability of economic methodologies on carbon sale and related global financial facilities for projects on green buildings. (06)

26. Legal guidelines

- i. Use only certified timber and avoiding the use of illegally cut timber from forest reserves in designing buildings of all application . (2.1, 2.2)

- ii. Use environment friendly and safe paints when buildings are colour washed. The paints being used should be free of heavy metals such as lead, Arsenic, cadmium and mercury. (2.1)
- iii. Buildings should not be constructed in declared forest reserves, wildlife sanctuaries or buffer zones' (except on special occasions). (01, 2.1)
- iv. Buildings must be built in such a way that they have easy access systems for all types of disabled people and people with special needs. (01, 2.1)
- v. When developing 'heritage buildings' as 'green buildings' no alteration must be made without prior approval. (01, 2.1)
- vi. Construction of roads and buildings should not be made in areas which are declared as archeological reserves without prior permission. (01, 2.1)
- vii. Construction sites should free from mosquito breeding grounds or breeding grounds of other parasites. (2.1)
- viii. Prohibition of the use of lime made of seashells and corals in constructing buildings. (2.1)
- ix. A standard fire and lightening safety system should be established when constructing state buildings.(01)
- x. Prohibition of smoking in buildings. (03)
- xi. If Air conditioners run by natural coolants such as Ammonia and Hydrocarbon are used, proper safety measures have to be adopted. (03)
- xii. Construction site must be above the general flood level. The land under no circumstances, must be filled upto that level. (01, 2.1, 2.3)
- xiii. Treating waste water 100% (upto national standard level) within the building site. (03)
- xiv. The building must be built with easy access facilities for disabled people and people with special needs to enter the building at each entrance. (01, 2.1, 2.3)
- xv. When 'heritage buildings' are developed as green buildings, no change should be made without prior permission. (2.2, 2.3)
- xvi. Buildings and roads in areas declared as archeological reserves should not be built without permission (01, 2.1)

- xvii. The approval should be obtained from Ministry of Disaster Management, when designing of building to be constructed in vulnerable areas for natural disaster.

27. Social, economic, cultural and health guidelines

- i. Avoiding the use of gutters in the first and second floors of buildings to prevent the spread of diseases such as dengue. In places where the use of gutters is unavoidable, they can be used by making the following changes.
 - (a) Increasing the number of down pipes bringing water to the ground and fixing them in short distance in between two pipes with little slant (2.1, 2.3)
 - (b) Covering gutters with a net so that to prevent entering mosquitoes and dead leaves (2.1,
- ii. Reduce the use of CFL bulbs with mercury and finally stopping their use. (03)
 - i. Encourage workers to refrain from wasting of water. (03)
 - ii. Installing a suitable water dispenser with purification within the buildings to minimize the use of plastic bottles of water and promote glass bottles. (03)
- iii. Buildings should be built portraying and preserving the cultural identity of the area . (01, 2.1)
- iv. A plot of land for cultivating vegetables should be allocated in order to promote indigenous agricultural heritage and village life style for promoting healthy food habits. (01, 2.1)

28. Implementation of the guidelines

Preparation of these guidelines has been done with the participation of nearly 50 institutions and in order to implement the guidelines, all necessary requirements must be met. An action plan with a specific time frame must be prepared in order to obtain the contribution from different constitutions. In order to fulfill the preliminary requirements enshrined in this Action plan, each institution should implement the relevant activities. A standing Committee (Co-ordinating and Monitoring Committee) must be appointed by the Ministry of Mahaweli Development and Environment to implement this action plan and monitor its implementation.

29. After implementing the plan requested for meeting the basic necessities of applying the guidelines within a specific time frame, the application of each guideline must be entrusted to the relevant institutions. If not, application of the guidelines in accordance with the need must be entrusted to an institution established specifically for that purpose. An institution should be identified and strengthened for implementing a rating system to assess how the building is green by placing specific weight on each guideline.

- Application of guidelines for green buildings must be incorporated with the Annual plans and plans of action of the institute within given timeframe. Relevant institutions must incorporate sections to their Acts and regulations to apply and monitor these guidelines. On the recommendations derived from implementing and reviewing the action plan, An Act, if necessary should be drafted to reinforce the application of guidelines for green buildings.
30. In making annual budgets, the application of these guidelines must be reviewed for incorporating the guidelines in the national development process by raising required funds.