

11th International Conference on Modern Building Materials, Structures and Techniques,  
MBMST 2013

## Sustainable Development of Rural Areas' Building Structures Based on Local Climate

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### Abstract

Sustainable development is a new concept with various perspectives in communities. Cities and rural areas are in the core of attention for developing. This study focuses on rural areas. Stability of building structures is so important in villages and rural areas. One sustainable development criterion of villagers is suitable housing. In this research, both new and traditional technologies are investigated for developing rural areas. The most part of Iran is in desert areas. This research investigates these areas in Iran as a case study. Two MCDM methods is applied as a new hybrid model in this research, at first SWARA is applied for weighting criteria and then COPRAS is applied for evaluating five selected building structures in term of these regions climate. Authors propose that this research can be useful as a framework for using in other regions in all around the world.

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Selection and peer-review under responsibility of the Vilnius Gediminas Technical University

*Keywords:* Sustainable Development; Rural Areas; Bulding Structures; Local Climate; SWARA; COPRAS; Multi Criteria Decision Making (MCDM).

### 1. Introduction

Sustainability, as a new paradigm in the past three decades, showed through some scientific evidence that flora and fauna species, water, air, forests, deserts and other ecosystems began to destroy and natural resources were overused. Since sustainability is a multidimensional issue (local, regional, and international dimensions), it have to be developed at a level that people live, work and interact with each other and with nature such as local level [1]. "Sustainable development" (SD) was the only approach, after introducing this new paradigm that dealt with the problems resulted from degradation of the environment introduced by the Commission Report [2]. Because SD is accounted as a key insight to society further development, it has changed to a significant aim for policy makers [3] that is improving the lifestyle of the current population so that will not have a negative impact on future generations [4]. The nature of the research of the sustainable development problems is multi and interdisciplinary. Moreover, the regional aspect of the sustainable development research is its key aspect. Attempts to show processes and changes interaction of the various nature in the different regional systems herewith. According to the literature, two different classes of SD are implemented and they begin with developed and developing countries:

**First class.** A class confronts with the problems of the environmental pollution and excessive consumption of natural resources.

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**Second class.** A class specified by the feature of developing countries such as rapid growth in population, poverty, gender inequality, education, and medical service problems. The common and important characteristic of both developing and developed countries, however, is their progress based on natural evolution patterns. But, the rate of their economic and welfare growth has been different [4].

In order to achieving the goal of rural sustainable development in most developing countries, which promotes social and economic development of local communities, the rural areas cooperatives face with limitations [5]. There some elements which are needed to establish a sustainable economy in rural areas that are infrastructure, clean seeds, guidance in crops and livestock production, and credit as well as cooperatives, education, marketing facilities, farm machinery, water supplies, and diverse economic activities. All of them are necessary to establish a sustainable and efficient rural development in each village.

As a developing country, Iran has 65 000 villages with about 22 million people living in rural areas. They are living under poverty line and their survive depend on agriculture, whether directly or indirectly [6], [7]. Beside, agricultural sector which accounts for 27% of GDP, 22.9% of employment opportunities, 82% of food supply and 35% of non-oil exports, plus considerable raw materials for industrial use dominate the Iranian rural economy [8]. Thus, it becomes an important issue for Iranian government policies so that they begin to conduct some projects for sustainable development of this area.

In recent years, after occurring some earthquake with no high Richter scales and destroying many rural areas and villages buildings, concerns were on the fact that rural areas buildings in Iran were not suitable for that condition. Many people in Kerman province and Guilan province dead because of the earthquakes in recent decades. One important issue in sustainable development is people welfare in their community, whether cities or villages. Nooripoor and Shahvali [9] proposed that evaluating and prioritizing the sustainability of villages and rural areas are more important than just having a knowledge about them.

This research focuses on improving structures of rural areas. Buildings are important for this research aim and decision making about building the structures in the villages is the priority of this research. In construction management one constantly confronts with various problems that require effective decisions. Decision environments, from a single person and a single criterion (profit), eventually become multi-person and multi-criteria. Multiple criteria decision making methods (MCDM) can be used effectively to determine the value and the utility degree of the construction projects and to establish the priority order of their implementation [19].

Villages of the desert regions are more important for this research because many areas of Iran are deserts. The case study of this research is such areas in Iran as Yazd, Kerman and Semnan provinces.

In this research two MCDM methods are applied. At first, SWARA method is applied to evaluate and weight the criteria of sustainable development buildings of rural areas and then, COPRAS is applied to evaluate and prioritize buildings structures systems.

## **2. Architectural technologies usable in rural areas**

This section is written based on Golabchi and Mazaherian [10] book.

### *2.1. Light Gauge Steel Frames ( $A_1$ )*

“Light gauge steel frames” is one of the constructing mechanisms used for building with limited number floors (e. g. 5 storey buildings). The system components are: intersecting layers of light gauge steel sheets to provide the stability of the structure, plaster sheets and timbers as inner cover noise and heat insulating layers, outer walls as the face. The system is industrially produced and is set up using bolt and knot. The system is usually used as independent structure in several storey buildings mass production.

### *2.2. Insulating Concrete frameworks ( $A_2$ )*

One of most modern structural system which has been extensively used in recent years is “Insulating Concrete Frameworks”. Its components are reinforced concrete as load bearing component, and expanded polystyrene panels functioning as concrete mould and heat insulators. This technology originated from Europe, in 1950s and 60s, and was then used as an efficient technology in construction. Afterwards, because of numerous architectural benefits, it was used worldwide.

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