

ENVIRONMENTAL FACTORS INFLUENCING URBAN LAND USE

Rūta Dičiūnaitė-Rauktienė¹ and Vida Maliene^{1,2}

¹ Aleksandras Stulginskis University,

² Liverpool John Moores University

Abstract

A clean and healthy environment can be considered as the greatest fortune which humanity possesses and upon which the survival and existence of the humankind depend. The urban environment and its physical quality are especially important because of the population migration to the cities. In the last decades of the 20th c. people more often leave the countryside and move to live in the cities, as the result, the environmental pollution and the usage of natural resources are increasing. The daily small and large-scale activities of the cities and regions one way or another contribute to the total effect of the urban land on the environment. The more people there are, the more serious problems arise. The environmental factors in the urban land are especially important and form an integral part of the sustainable development priorities. In order to protect the environment, it is important to evaluate the environmental criteria which will influence the urban land use.

The aim of the article: to point out the environmental criteria influencing the urban land use on the basis of the literature review. The object of the article – the environmental criteria influencing the urban land use. The analysis was conducted using the methods of scientific publications, statistical analysis and synthesis. This is the review article.

Key words: urban land, environmental criteria, land use.

Introduction

Currently, the process of urbanisation changes the view of the Earth's surface, climate and biodiversity the most (Grimm et. al. 2008, Seto et. al., 2011).

200 years ago only 3 % of the humankind lived in the cities. However, lately people more often leave the countryside and move to live in the cities (Thomas, 2008), the movement has been noticed since 1800 (Muggah, 2012), in 1900, 13 % of the population lived in the cities, in 1950 – 30 % of the population, in 2005 – 49 % (O'Neill et. al. 2012), in 2014 – 54 %, and in 2050 at least 66 % of the population is considered to live in the cities (World Urbanization Prospects, 2014). It means that more than a half of the world population already lives in the cities (Griffith, 2009).

The rapid processes of the urbanisation influence the density of development, traffic intensity resulting in the increase of environmental pollution and this negatively influences the life quality and health of the population. According to J. Vanagas (2008), the main aim of the city planning is to create the best living, work and leisure conditions for the people, protect their health from the harmful effect of natural, industrial and other conditions. Therefore, in order to protect the environment, it is important to evaluate the environmental criteria which will influence the urban land use.

The object of the article - the environmental criteria influencing the urban land use.

The aim of the article: to point out the environmental criteria influencing the urban land use on the basis of the literature review.

Objectives:

- to analyse the changes of urbanisation;
- to analyse the factors influencing the life quality in the urban land;
- to point out the environmental criteria influencing the urban land use.

Methodology of research and materials

The analysis was conducted using the methods of scientific publications, statistical analysis and synthesis.

Discussions and results

The changes of urbanisation (population migration from the countryside to the city and rapid increase of the cities) were influenced by the need of manpower in the cities (Oluwatayo, Opoko, 2014) and the increasing human population (in 1930 there were about 2 billion people, in 2014 – about 5.8 billion, in 2025 m. – the number of people should reach 8.5 billion) (World Bank, 2015). It is believed that the urbanisation will continue to grow rapidly, especially in the less developed countries (Fig. 1).

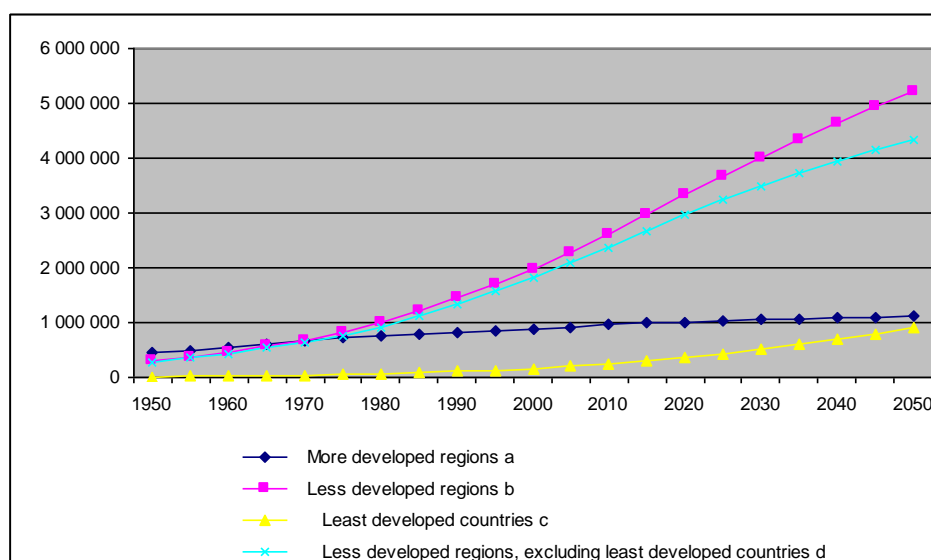


Fig.1. Urban and rural population in less and more developed regions

Source: United Nations, Department of Economic and Social Affairs, Population Division, 2014
World Urbanisation Prospects: The 2014 Revision, custom data acquired via website.

Symbol Description

- a More developed regions comprise Europe, Northern America, Australia/New Zealand and Japan.
- b Less developed regions comprise all regions of Africa, Asia (excluding Japan), Latin America and the Caribbean plus Melanesia, Micronesia and Polynesia.
- c The least developed countries are 49 countries, 34 in Africa, 9 in Asia, 5 in Oceania plus one in Latin America and the Caribbean.
- d Other less developed countries comprise the less developed regions excluding the least developed countries.

As it can be seen in Figure 1, the urbanisation has been growing rapidly since 1950. Less rapid growth was recorded only in the more developed regions.

The urban lands are divided according to the population number: small urban land - when the population is less than 200,000; medium-sized - when the population is 200,000 – 500,000; city - population is 500,000 – 1.5 million; large city - when the population is more than 1.5 million (OECD, 2013).

The cities with million inhabitants are growing rapidly (Fig. 2). Different statistical sources sometimes present different population number of the same cities. These differences occur because the population number of large cities can be taken only from the main city or the whole agglomeration (Demographia World Urban Areas, 2015).

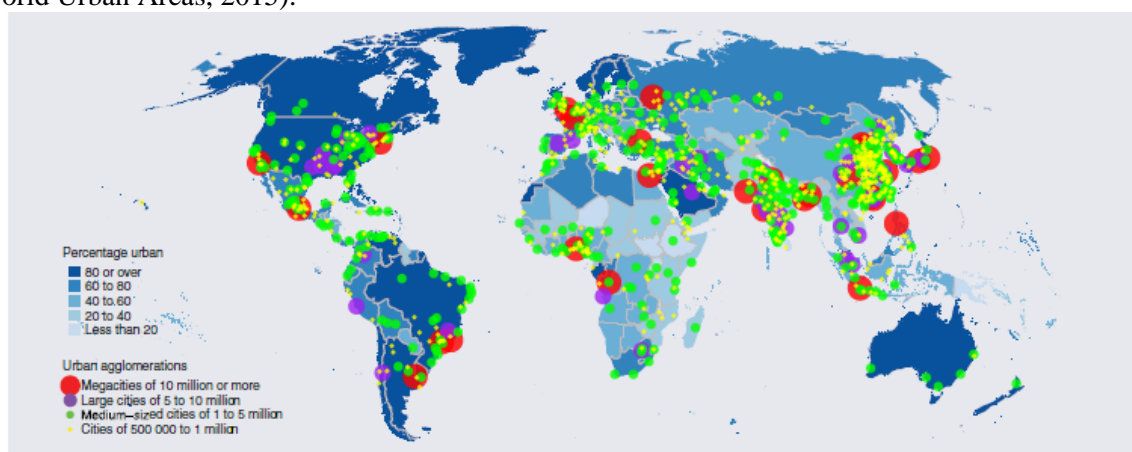


Fig. 2. Percentage urban and location of urban agglomerations with at least 500,000 inhabitants, 2014
Source: World Urbanization Prospects. The 2014 Revision. Highlights

As it can be seen, the level of urbanisation in various countries differs greatly. According to this rate, the countries can be divided into three groups: countries of high urbanisation rate – the level of urbanisation is greater than 70 %; countries of average urbanisation rate – the level of urbanisation is 40–70 %; countries of low urbanisation rate – the level of urbanisation is less than 40 %.

The urban environment is mostly described as the city environment, as physical, cultural, social environment, which binds the group of people living in a compact manner (Clark, 2009). The physical (natural) parts of the environmental components can be considered to be the environmental air, climate, flora, soil, etc., however, the artificial phenomena and objects, such as infrastructure, buildings, traffic jams, noise, etc., can be ascribed to them as well. In the cities these components influence the life quality, conditions and activities of the humans the most. Therefore, the urban land use has to be well-judged and sustainability components have to be considered (Daily et. al. 2009, Goldstein et. al. 2012, Nelson et. al. 2009, Viglizzo et al. 2012, Yeg, Huang, 2009). For example, when carrying out the construction works in the urban land the possibility of too high population density, the significant decrease of greening, the possibility of the traffic jams should be considered (Mickaityte et. al. 2008; Baltrenas et al., 2007) as all this influences the condition of environmental quality and the population life quality in the urban land.

Deveikis et. al. (2014) emphasise the importance of the green spaces in the cities, since they capture 20–86% of dust, positively influence the microclimate and protect from the pollution and noise. Moreover, they support the spatial expression of landscape (Deveikiene, 2015).

According to Vanagas (2008), the main quality indicators of the inhabited area can be considered to be the communication, noise and air quality. However, according to other authors (Gerikiene, Malakauskiene, 2013), the environmental quality in the cities can be evaluated on the basis of various aspects, which depend on the living conditions as well as on various physical elements. However, in the urban land, the main factors can be considered to be air pollution and quality, water pollution, physical pollution (noise); waste management; soil quality, green spaces and open spaces, protected areas, visual quality.

As the population number in the cities (urban land) is growing, the population density grows as well, the result of which is the increase of the traffic intensity (Browne, 2012). The air pollution caused by the transport negatively influences life quality of the populations, harms the historic buildings and flora (Vlachokostas et al. 2010), negatively influences the environment, i.e., causes the climate change (Clark, 2009; Czischke et al., 2015), the increase of the greenhouse effect (Sostak, 2011). Thus, the most serious problem prevailing in the urban land is great air pollution in large cities (Guerreiro et. al. 2014; Hardoy et. al. 2013, Vlachokostas et. al. 2011), which, according to the data of the conducted analysis, influences the majority of people (morbidity of diseases associated with the environmental pollution) living in the city (Dockery, Pope, 2006, WHO, 2003). Therefore, it can be stated that air pollution in the cities is one of the most important factors of the environmental quality (Chen, Kan, 2008).

The biggest problem of the air quality of European cities is too high concentration of the particulate matter (PM₁₀) in the air (Fig. 3).

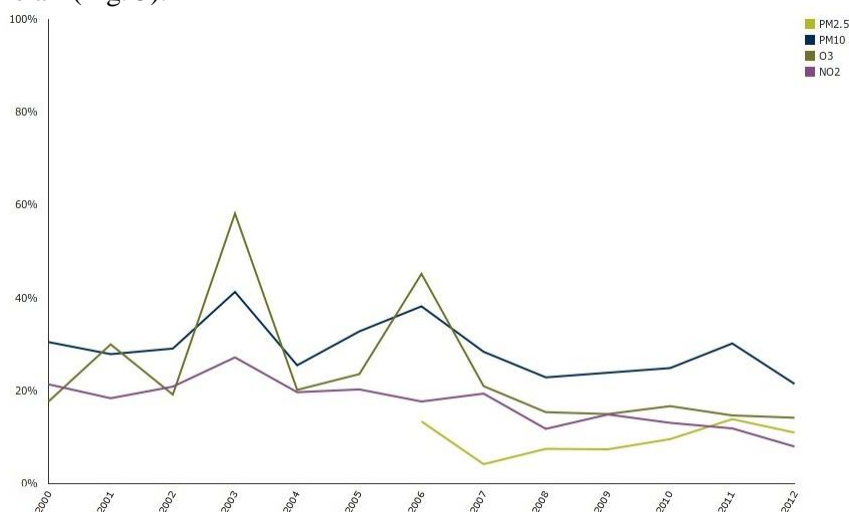


Fig. 3. Urban population to air concentrations above selected limit and target values

Source: European Environment agency, 2015

Criteria:

Percentage of population exposed to annual PM_{2.5} concentrations above 25 µg/m³.

Percentage of population exposed to daily PM₁₀ concentrations exceeding 50 µg/m³ for more than 35 days a year.

Percentage of population exposed to maximum daily 8 hour mean O₃ concentrations exceeding 120 µg/m³ for more than 25 days a year.

Percentage of population exposed to annual NO₂ concentrations above 40 µg/m³

From the data submitted by the European Environment Agency, in the period of 2001–2011, the daily limit value for PM₁₀ (50 µg/m³) was exceeded by 20–44 per cent in the urbanized areas of EU-27, however, the permitted number of days when air pollution PM₁₀ may exceed the limit value (35 days) was mostly exceeded in 2003, 2006, and 2011 (European Environment Agency, 2013).

A similar situation occurs with nitrogen dioxide (NO₂) - in the analysed period of 2001–2011 the average annual NO₂ limit value (40 µg/m³) was exceeded by 5–23 per cent, it also occurs with ozone (O₃), which is considered to be the most prevalent pollution affecting the human health (Xu et. al, 2015). 2001–2011, 14–65 % of the urban population in EU-27 was exposed to ambient ozone concentrations exceeding the EU target value set for the protection of human health (120 microgram O₃/m³ daily maximum 8-hourly average, not to be exceeded more than 25 times a calendar year, averaged over three years and to be achieved where possible by 2010). Sulphur dioxide (SO₂) in the period of 2001–2011 exceeded the permissible norms as well (European Environment Agency, 2015) (Fig. 4).

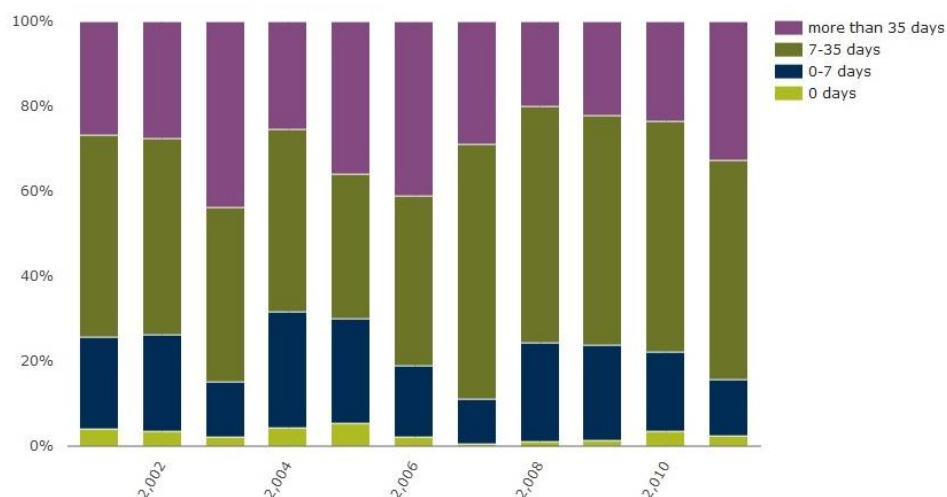


Fig. 4. Percentage of urban population resident in areas for days per year with PM₁₀ concentration exceeding daily limit value

Source: European Environment agency, 2015

The limit value is 50 µg PM₁₀/m³ (24 hour average, i.e. daily), not to be exceeded more than 35 times a calendar year. Over the years 2001–2011 the total population for which exposure estimates are made, increased from 66 to 149 million people due to an increasing number of monitoring stations reporting air quality data under the Exchange of Information Decision. Air quality and pollution are also determined by benzo(pyrene), which is emitted into the environment by gas exhausted by transport or by stationary combustion plants (Aplinkos oro kokybės vertinimo vadovas, 2006). The target value (1 ng/m³) of benzo(a)pyrene in large cities that was estimated in 2012 and introduced from 31 December, 2012, has been exceeded (European Environment Agency, 2013).

Thus, it can be said that the urban environment and its physical quality is particularly important with regard to human migration to cities. In addition to ecological phenomena, the urban environment affects social phenomena as well. Due to rapid population growth, urban land of the developed and developing countries face a number of environmental problems. Urban environmental problems that specifically determine the quality of life in urban land and that should be paid the greatest attention can be distinguished as follows: extinction of biodiversity, decrease in green spaces, air quality problems due to traffic emissions resulting in detriment to vegetation and historic buildings, increase of greenhouse effect, climate change, and increase of environmental pollution-related diseases (Fig. 5).

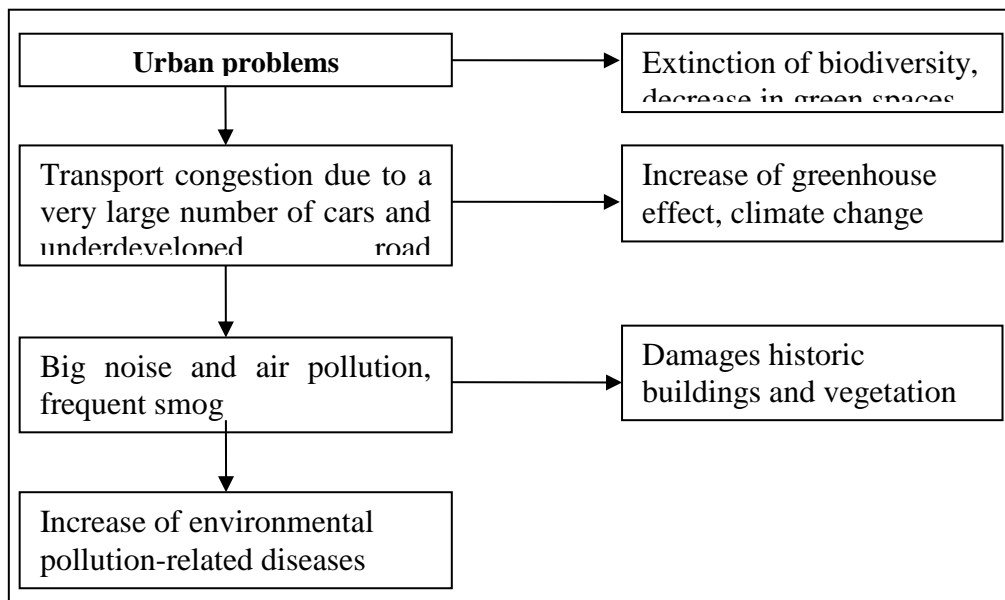


Fig. 5. Major environmental problems of cities determining the quality of life in urban areas

Thus, rapid processes of urbanization also determine building density, resulting in increasing environmental pollution, which affects the quality of life and health adversely. According to Vanagas (2008), the main urban planning goal is to give people the best living, working, and recreation conditions, to protect their health from harmful natural, industrial and other impact. Therefore, developing master plans of the cities, it is important to lay out the industrial areas in such a way that emissions of industrial companies would have minimum impact on adjacent areas. Areas that are protected from harmful effects and best meet the ecological needs should be allocated to the living area (Vanagas, 2008).

According to Baltrenas et al. (2008), the reduction of pollution is one of the most important environmental tasks. The reduction of urban air pollution and clearing and cleaning of sites contaminated with hazardous chemicals will protect population from harm and will preserve their health. The reduction of carbon dioxide is important in improving traffic conditions and reducing the negative environmental impact of transport.

Therefore, it can be said that the main environmental criteria that should be taken into account when planning the use of land in urban areas have to be linked with the reduction of air pollution and maintenance of ecological balance (Fig. 6). This requires urban regeneration, which must include the establishment of harmonious and attractive environment – establishing “the compact building of residential areas” and quality infrastructure (Grazuleviciute - Vileniske, Urbonas, 2013, p.82).

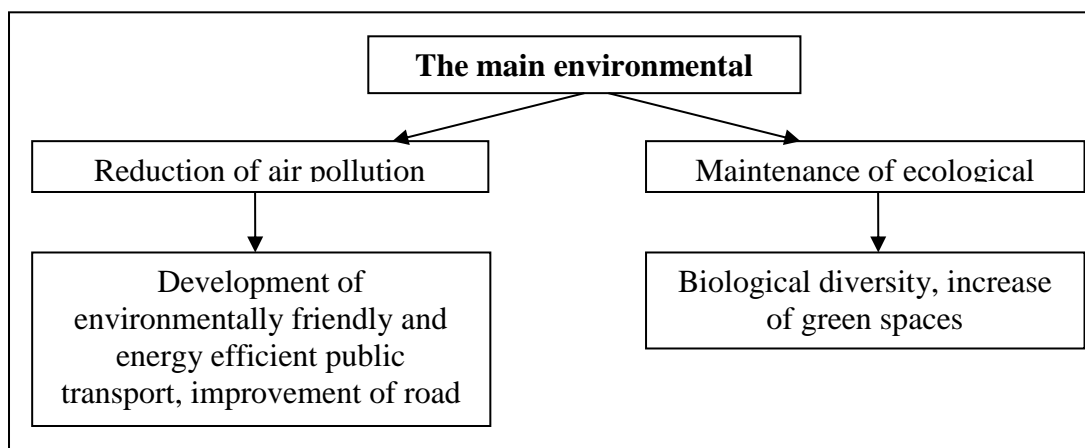


Fig. 6. The main environmental criteria

European Economic and Social Committee (ECO/273, 2010) also expressed the opinion on “the need for an integrated approach to urban regeneration”, which states that ordinary urban measures in

modern cities are inefficient, because “the city has now become not only an energy wasting system, but also one of the main causes of environmental change. Therefore, it is important that while fighting harmful CO₂ emissions and climate change, EU would coordinate its actions and seek after more decisive policy of urban regeneration“. It is also indicated that the objective of urban regeneration policy is “to integrate sustainable transport and energy systems“, and that “the priority is given to an integrated urban regeneration model”. Urban regeneration has to take into account the decaying of green spaces, which results in decreasing biodiversity (ECO/273, 2010), as well as transport systems in order to reduce energy use and pollution (ECO/273, 2010; Balaban, Puppim de Oliveira; 2014).

Conclusions and proposals

The parts of natural environment components are as follows: ambient air, climate, vegetation, soil, artificial phenomena and objects - infrastructure, buildings, traffic jams, noise, etc. In cities these components mostly determine the quality of life, conditions and activities. Therefore, the use of land in urban areas has to be well- judged and should take into account the sustainability components, because all of this determines the environmental quality status and the quality of life of population in urban areas.

Urban land where industrial constructions and traffic congestion regularly occurs faces with increased pollution, noise, dust, so in order to maintain a healthy and harmonious environment, it is important to use land in accordance with the environmental requirements. Failure to comply with these requirements will result in the increase of air pollution having an adverse effect to the environment and people living there. In compliance with the current situation and future trends discussed, we can say that in order to protect the environment in urban land, it is important to assess environmental criteria, which will determine the land use in urban areas.

In order to improve the urban environment, it is important to take appropriate air pollution measures. Therefore, developing master plans of the cities, it is important to lay out the industrial areas in such a way that emissions of industrial companies would have minimum impact on adjacent areas. Areas that are protected from harmful effects and best meet the ecological needs should be allocated to the living area. In order to improve road infrastructure, it is important to develop environmentally friendly and energy efficient transport and maintain the balance by increasing the number of green spaces and biodiversity.

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Information about authors

Rūta Dičiūnaitė - Rauktienė is a Phd student studying at the Land Management and Geomatics Institute, Faculty of Water and Land Management, Aleksandras Stulginskis University. Her current area of study surrounds the topic of development of the model for cities sustainable highstreets. Contact details: Land Management and Geomatics, Faculty of Water and Land Management, Aleksandras Stulginskis University, Universiteto 10, Akademija, Kaunas 53361, Lithuania, E-Mail: diciunaite200@yahoo.com, Tel: +37067267090.

Vida Maliene, PhD, is a Reader in Property and Planning studies at the School of the Built Environment and an active member of the Built Environment and Sustainable Technologies (BEST) Research Institute, both at Liverpool John Moores University in the UK. Vida is a Visiting Professor at Institute of Land Management and Geomatics in Aleksandras Stulginskis University, Lithuania. Her research focuses on Property and Planning including such related subjects as Spatial and Urban Planning, Urban Regeneration and Sustainable Communities, Land Management and Economics, Property Valuation and Taxation. Vida has published over fifty scientific papers in International peer-reviewed academic journals and conference proceedings, a book/monograph, eleven book chapters and several journal editorials. She is a fellow of the Higher Education Academy, member of Executive Board of European Academy of Land Use and Development (EALD) in Zürich, member of the European Group of Operational Research and the International Council of Research and Innovation in Building and Construction (CIB). Contact details: Department of the Built Environment, Liverpool John Moores University, Byrom street, Liverpool L3 3AF, United Kingdom; email: v.maliene@ljmu.ac.uk; Tel.: +44-(0)-151-231-2854.