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## **Renewable energy sources as an alternative to the new usage of brownfields**

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### **Vývoj nezamestnanosti vo vzťahu k vzdelanostnej úrovni obyvateľov Slovinska**

Snahou príspevku je poukázať na špecifiká pri meraní nezamestnanosti ako významného faktora vplyvajúceho na sociálno-ekonomickú situáciu regiónov. Modelové územie predstavovali štatistické regióny (NUTS III) Slovinska. Na základe porovnania jednotlivých typov nezamestnanosti môžeme konštatovať výrazné disparity medzi juhozápadnou a severovýchodnou časťou štátu. Tieto rozdiely sú ovplyvnené nedostatkom pracovných príležitostí na regionálnych trhoch práce, nedostatočnou flexibilitou a kvalifikáciou pracovnej sily (hlavne v Korošskom a Pomurskom regióne), ako aj slabou ponukou pracovných príležitostí predovšetkým v sektore priemyslu a služieb.

Na základe tejto analýzy môžeme konštatovať, že vedúce regióny ležiace v juhovýchodnej časti územia (Gorišký, Gorenký, Prímorsko-krašký a Stredné Slovinsko) majú problém s krátkodobou nezamestnanosťou a nezamestnanosťou vysokoškolsky vzdelaných obyvateľov, čo je v kontraste so severovýchodnou časťou územia (Pomurský, Korošský región), v ktorých prevláda dlhodobá nezamestnanosť a nezamestnanosť obyvateľov bez školského vzdelania, resp. iba so základným vzdelaním.

### **RENEWABLE ENERGY SOURCES AS AN ALTERNATIVE TO THE NEW USAGE OF BROWNFIELDS**

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**Abstract:** The subject of brownfields has recently become a widely discussed issue. The number of abandoned and unused facilities in the Czech Republic is quite large, which results in a number of problems. Typical example of a revitalization is a complex demolition or renewable which would give the place in question a new function. (business, administrative, residential, free-time..). Another typical example is a revitalization of the object or the area while keeping some of its original construction

*and functional features. An example of an “alternative solution“ is to make use of brownfields in a way that would support the development of renewable sources of energy, especially solar and wind power stations, an activity that can be observed in many countries of the world.*

**Key words:** brownfields, renewable energy sources, alternative usage, world, the Czech Republic

## **INTRODUCTION BRIEF THEORETICAL FRAMEWORK**

Old, abandoned, and unused facilities, often polluted – so called brownfields – can be found in many countries of the world which have reached a certain degree of economic development. Mostly in developed countries – and the Czech republic would like to be accounted for a developed country – they are something of a scar on the face of a town or a countryside. The origin of brownfields is connected with the restructuring of national economy, i.e. the change of agricultural-industrial society into tertiary civil sphere based on services (Greenberg et al., 2001). The aim of our article is to mention existing ways to revitalization in the world as well as in the CR, focusing on “alternative“ solutions taking renewable energy sources into account.

There are many ways how to reuse brownfields. Some of these activities are in progress (not) being helped by political will, legal status, and the amount of finance. Some solutions are effective both from economical and social point of view, others may give rise to disputes. The way revitalization is handled also differ according to original usage of brownfields, the size of areas and facilities, the extent of contamination, level of country economy, traditions, etc. (De Sousa, 2001; Kabisch, 2004; Kadeřábková, Piecha et al., 2009 and others). What we are most interested in are the differences in implemented projects caused by location in the landscape, i.e. the contrast between town and country environment.

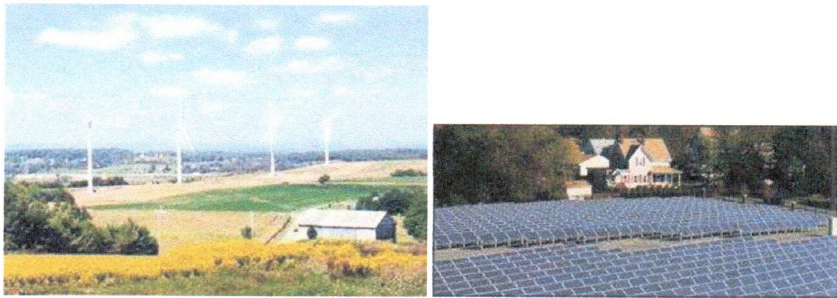
In the countryside, i.e. open landscape, the most frequent types of brownfields are agricultural ones (Věžník a Svobodová, 2009), some types of military ones (large military airfields, e.g. Šilnánková et al., 2006) or industrial ones (mining areas). Brownfields in urban environment are, possibly because of the fact a significant number of people are aware of them (Klusáček et al., 2009; Kunc et al. 2011), more important for the “man – environment – life quality” relationship. Urban environment is thus the environment that provides us with industrial (factories as well as excavation and mining areas, De Sousa, 2001; Vojvodíková, 2005; Sýkorová, 2007), military (town military barracks, Kuda a Smolová, 2007), transport (railway stations, parking lots), and residential brownfields, as well as many others.

## BROWNFIELDS AND ALTERNATIVE SOLUTIONS IN THE WORLD

What is meant by alternative utilization of brownfields? Our article deals with brownfields and renewable energy sources, which could look like a bit strange idea. Let us imagine it. Vacant houses and premises can be demolished, put to the ground. The soil which have been exploited for decades is often contaminated and thus if of any use for e.g. agricultural purposes or residential site, etc., then only after huge investments on decontamination.

Environmental Protection Agency of the USA (EPA) lists (<http://www.epa.gov>) hundreds of brownfield sites. These are divided according to individual states or according to overwhelming possibilities of future utilization with respect to five types of renewable energy sources, which are: wind, solar, biomass, geothermal and landfill gas. In this way general public as well as a potential investor can get basic information concerning these locations.

One of the areas with a considerable amount of abandoned facilities is the vast Appalachian Mountains range spreading for 3 thousand km from South to North in the eastern part of the USA. Although this well known region has already exploited its coal mining potential, there still exist possibilities for alternative usage of the area. EPA takes part in supporting wind, solar, and biofuel refineries up and down the abandoned mining areas in the Appalachians<sup>8</sup>.



**Fig. 1: Wind power station in Somerset (Pennsylvania) in the place of an abandoned coalmine and solar panels in the brownfield in Brockton (Massachusetts)**

Source:

[http://www.epa.gov/reg3hwmd/bf/lr/newsletter/2009Spring/renewable\\_energy\\_mining.html](http://www.epa.gov/reg3hwmd/bf/lr/newsletter/2009Spring/renewable_energy_mining.html)

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<sup>8</sup> [http://www.epa.gov/reg3hwmd/bf-lr/newsletter/2009-Spring/renewable\\_energy\\_mining.html](http://www.epa.gov/reg3hwmd/bf-lr/newsletter/2009-Spring/renewable_energy_mining.html)

Concerning urban areas we can introduce the Solar America Cities project, which recently represents 25 major American cities with solar power stations. One of them is Chicago, where the biggest “city” solar power station in a brownfield in the USA with the capacity of 10 MW is located<sup>9</sup>.

One of the biggest solar power stations in a brownfield in the world is in Germany and ranks in the TOP 10 biggest solar power stations worldwide. Solar park Lieberose (south of Berlin, Brandenburg) has a capacity of 53 MW and supplies about 15 000 households. It is planned that this power station should produce energy for about 20 years.

An area of 163 hectares which is recently covered by 560 thousand thin-layer solar panels used to be a military area and Soviet Army troops were trained here 20 years ago. Brandenburg government decided to lease the landplots for 20 years. The money from the landplots lease from the project investors should be used for the ecological remediation of the location, where a protected landscape area should emerge in 20 years. The companies which built the power station have undertaken to completely demolish it after the solar panels expire<sup>10</sup>.



**Fig. 2: Photovoltaic power station Lieberose in Germany**

Source: Flickr.com

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<sup>9</sup> <http://www.smartplanet.com/blog/cities/cities-lighten-up-brownfields-with-solar-panels/416>

<sup>10</sup> <http://www.nazeleno.cz/energie/fotovoltaika-1/5-nejvetsich-slunecnich-elektren-na-svete.aspx>

## **BROWNFIELDS AND ALTERNATIVE SOLUTIONS IN THE CZECH REPUBLIC**

The interest in the brownfields issue in the Czech Republic started some 15 years ago, several decades later than in the world most developed countries. If an individual issue was solved, it mostly took on the traditional form, i.e. demolition or reconstruction of the original facilities and their usage for new commercial purposes. The alternative way of using the brownfields to support the renewable energy sources is highly up to date.

Up to now the investors are interested in photovoltaic devices only because these can be, contrary to wind turbines and biogas stations, mounted on a flat base and can be placed both on vacant areas (former landfills, military areas and airports, and demolished factories areas) and roofs of unused factories or cooperative farms.



**Fig. 3: Solar power station Ralsko Ra 1 in former military area and solar power station Rožná (DIAMO I.) in the area of uranium mining.**

Source: <http://m.ihned.cz/index.php?article%5Barea;>

<http://www.realit.cz/clanek/vyuziti-brownfieldu-muze-byt-take-pouze-docasne>



**Fig. 4: Solar power station Slavkov u Brna (Southern Bohemia) in the place of a former sugar refinery and solar power station Libouchec in Northern Bohemia (former factory AZNP Mladá Boleslav)**

Photo: Josef Kunc

Former military area Ralsko (Northern Bohemia) provides ideal space for the installation of solar panels. Recently a power station with a capacity of 38 MW (biggest in the CR) is located here. Its aspiration to become the biggest photovoltaic power station in the world was not, till the government regulation of the purchase prices of electric energy from the photovoltaic power stations this year, only a utopia. Similar suitable location is the uranium mine Rožná (Vysočina region) sedimentation basin, where a remediation is in progress (see figure 3).

In figure 4 you can see a solar power station at the edge of the town of Slavkov u Brna in the place of former sugar refinery whose facilities were demolished and the soil marked as unsuitable for farming. The solar power station in the municipality of Libouchec stands in the place of former engine factory of AZNP Mladá Boleslav right in the middle of residential premises.

## **CONCLUSION**

In the Czech Republic hundreds of brownfields can be found both in urban and rural areas. Their new usage is, similar to North America or Western Europe, difficult for a number of well known reasons. Some new industrial zones, business centres or production lines emerge. Nevertheless, most of the locations are abandoned and falling into disrepair, as there is a lack of finances and political will needed for their revitalization.

During the last three years, following the rise of interest in photovoltaic devices, the interest in abandoned landplots and areas has risen. Today decades of solar power stations located in brownfields can be found, both in the country and at the outskirts of towns where they do not occupy good quality farmland. In the future following usage of brownfields for similar alternative purposes can be expected and, taking into account other countries experience, not only for photovoltaic energy.

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#### **Obnovitelné zdroje energie jako alternativa nového využití brownfields**

Problematika brownfields se stala v posledních letech velmi diskutovanou záležitostí. V České republice je odkaz opuštěných a nevyužívaných objektů a areálů více než patrný a nese s sebou celou řadu problémů. Klasickým příkladem znovuoživení je komplexní demolice či asanace a přidělení nové funkce dané lokalitě (obchodní, administrativní, residenční, volnočasové...). Dalším klasickým příkladem je revitalizace objektu či prostoru při dochování některých původních stavebních i funkčních prvků. Příkladem „alternativního řešení“ je možnost využití brownfields pro podporu rozvoje obnovitelných zdrojů energie, zejména solárních a větrných elektráren, jak se již v řadě zemí světa děje.