

## Does rural space benefit from location of anaerobic digestion plants? Perspective of communal administration

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**Abstrakt:** Předkládaný příspěvek se ve své úvodní části věnuje teoreticko-metodologickým aspektům a předpokladům akceptace zařízení na výrobu energie z obnovitelných zdrojů obyvatelstvem ve venkovském prostoru. Dále je diskutován význam veřejné správy, která byla identifikována jako jeden z klíčových faktorů působících na rozhodovací proces spojený s lokalizací zařízení na výrobu obnovitelných zdrojů energie v území. Jádrem příspěvku tvoří výsledky dotazníkového šetření, které proběhlo se starosty obcí a měst, ve kterých jsou v provozu bioplynové stanice. Na základě identifikace přínosů a dopadů výstavby, a to jak očekávaných (před výstavbou) tak skutečných (realita po výstavbě), byl jako nejvíce problematický nalezen malý vztah mezi projekty obnovitelných zdrojů energie a rozvojem venkova jako takovým. Na druhou stranu není překvapující, že mezi hlavní klady těchto projektů byly často zmiňovány jejich environmentální přínosy, což vytváří potenciál pro jejich další rozvoj, a to i ve venkovském prostoru.

**Klíčová slova:** obnovitelné zdroje energie, akceptace, bioplynové stanice, Česká republika

**Keywords:** renewable sources of energy, public acceptance, anaerobic digestion plants, the Czech Republic

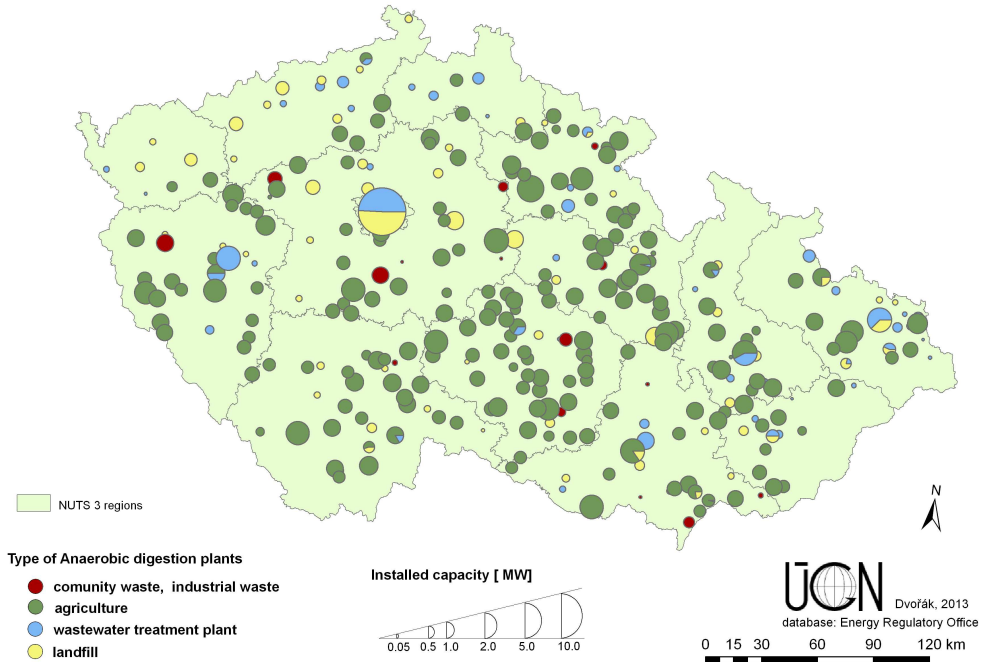
### Introduction

The importance of energy generated from renewable sources has been increasing recently. One of the sectors where huge development has been experienced is anaerobic digestion plants sector (biogas stations). Its number and installed capacities have dramatically risen in the last decade in the Czech Republic (11 installations with 4.19 MW in 2002, 481 installations with 363.24 MW by the end of 2012 – see spatial distribution – Fig. 1). There is no doubt that operation of anaerobic digestion plants, like other types of renewable sources of energy (wind power plants, solar power plants etc.), yields as an alternative to non-renewable fossil sources plenty of positives. However, renewable energy projects are also connected with problems too. Such problems are linked to the location, realisation and operation of such facilities which might have an important impact on the quality of life, landscape character and spatial relations within community. This study deals with socio-spatial aspects of renewable sources of energy with a focus on anaerobic digestion plants and their acceptance by mayors of local communities.

### Theoretical background

Rural development is rather an indefinite collocation whose content is strongly influenced by subjective opinions of individual groups of population or individual inhabitants of rural spaces (Navrátil, Pícha and Hřebcová 2010) or (Navrátil et. al. 2013). As there are large numbers of types of rural space (see e.g. Perlín, Kučerová and Kučera 2010), there is also wide spectrum of individual preferences towards individual phenomena, processes or development projects that are implemented in rural areas. If our focus is more narrowed to regional development projects, we come to the conclusion that there should be a clear fundamental agreement on the group of projects that are considered as beneficial to the public. Despite of rather vague and relative definition of this term (see e.g. Sieber 2005) it can be assumed that these types of projects also include the ones that support development of use of renewable sources of energies as sun, wind, geothermal energy or energy generated from biomass. Still it is undisputable that such type of projects with the planning of location of such projects rise controversies. Such controversies may be caused by both exogenous and endogenous factors. While the exogenous factors (such as unsuitably framed national or regional

subvention policy, unclear legislation for support of renewable sources or choice of inappropriate technology) could be perceived as hardly susceptible factors from the point of view of local population, the endogenous factors (such as acceptance/refusal of the project, its location, underrating of maintenance of technology or misleading abidance of technological procedures) can be influenced via particular steps applied on the local level. The acceptance of the given project on the local level by local population can be considered as the crucial endogenous factor of fundamental importance.

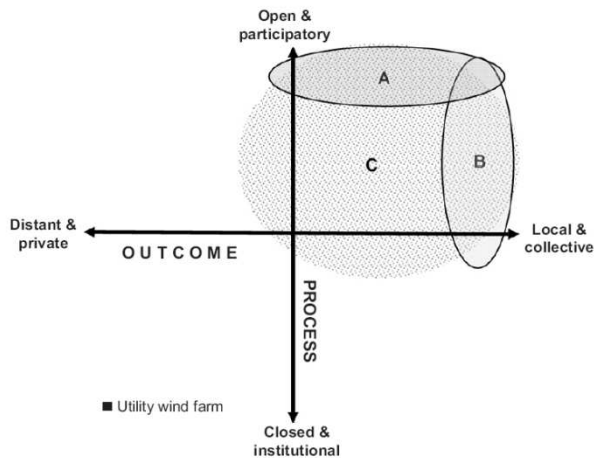


**Fig. 1.** Distribution of anaerobic digestion plants in the Czech Republic in 2012; Source: Energy Regulatory Office, own processing

It is a generally known fact that fossil sources of energy (oil, coal, natural gas) are depletable sources, whose using is accompanied by negative externalities as environmental pollution (Otáhal 2009), worsen quality of life of local population (Pasten and Santamarina 2012) or reduced tourism potential (Frantál and Kunc 2011). Another less favourable trend concerning exploitation of depletable resources is the climate change and global warming (Turton and Barreto 2006). As it can be obvious from the above mentioned arguments, the support for renewable sources of energies should be widespread. Nevertheless the reality is a little bit complicated. The energy generated from renewable sources is much more financially demanding under condition of EU countries (in comparison to classical sources) and its support from public budgets raises controversies (Jacobsson et al. 2006). Also the location of certain types of facilities for generation of renewable energy creates unexpected difficulties, however it appears that with the respect to their spatially limited extent (for example biomass incinerators or anaerobic digestion plants) in comparison to the classical sources (mines, heating or nuclear power plants, oilfields) they are unrivalled. Also their relatively simple dismantling (PV's) in contrast to the localities where classical raw material is processed and which stay unused in the landscape for decades could be perceived as an advantage. It is clear that also the other “weak” factors have to be taken into account (Van der Horst 2006, 2007, 2009). With the advancing deindustrialisation of society that can be generally described as a shift of labour force from industry to the branches of services (Corden and Neary 1982), the perception of places has dramatically changed, no matter whether we talk about local population or tourists. The projects that a couple of decades ago evoked enthusiasm of wide public for its technical perfection (constructions of dams, factories, nuclear power plants etc.) are today assessed by very different optics.

Disruption of landscape character (by PV's), coverage of agricultural land (by PV's), growing of agricultural plants for energy purposes (incineration plants for biomass) or the location of such facilities into the built-up area of communities (anaerobic digestion plants) – these are phenomena that are closely linked to renewable sources of energies despite of its indisputable benefits. The above mentioned phenomena raise plenty of controversies in public. This is the reason why the local public acceptance of renewable sources of energies should be taken into consideration when authorizing the process and attitudes of the mayors should be surveyed in detail.

Nowadays there is plenty of literature concerning various aspects of the acceptance of renewable energies. The factors that influence spatial distribution of wind power plants in the Czech Republic are surveyed by e.g. Cetkovský and Nováková (2009), Frantál and Kučera (2009), Frantál and Kunc (2010), who studied wider framework of spatial relationships, environmental and socio-economical connections. The factors of acceptance of wind power plants (in Denmark and India) and PV's (in Germany and the United States) were examined by Sovacool and Ratan (2012), the examples of acceptance of typologically different German projects for generation of renewable sources were investigated by Musall and Kuik (2011). From the point of view of conceptual contribution to the topic, study of Walker and Devine-Wright (2008) can be mentioned. They discussed benefits of such projects for local population on the community level. Walker and Devine-Wright focused in their research on individual options, benefits and impacts of types of ownership on the projects (axis X – private vs. collectively owned projects – see Fig. 2), they also evaluate the preparation of individual projects (axis Y – open vs. closed to public etc.). They came to the conclusion that the most profitable projects in general (and the easiest for public acceptance) are collectively owned projects for the development of facilities of renewable sources of energies. Such “ideal” projects should be owned by local stakeholders and the local public should participate in the process of preparation to have the possibility to influence the final decisions (sectors A, B, C in the scheme – see Fig. 2).



**Fig. 2.** Options for preparation and implementation of projects for construction of facilities for generation of renewable energies and final impact on local community; Source: Walker, Devine-Wright 2008

From the perspective of anaerobic digestion plants, which is the focal point of this contribution, the addition of the third axis (axis Z) can be discussed that could display above the axis X the re-use of agricultural waste as input material, waste from food industry or rest after sewage water treatments, i.e. positive contribution. In the space below the axis X it could symbolize using of inputs like agricultural plants (maize, corns) with the respect to the controversies that are usually linked to their use for energy purposes – i.e. not so positive contribution (Martinát et al. 2013). It is obvious that the sector delimited by Walker and Devine-Wright (2008) for “ideal” project would be narrowed. The above mentioned controversies are further discussed in studies by Jørgensen, Andersen and Cascaval (2012) or Roberts et al. (2013).

Another widely discussed concept that is closely linked to renewable energies is the so called NIMBY syndrome (Wolsink 2000). It can be explained as an attitude of population who supports

renewable energies on global, national or regional level, but not on the local level. Where such projects are located in the proximity of their residential space, people refuse it (NIMBY – Not-In-My-Backyard). Another stronger alternative (sometimes even absurd) of the above mentioned is the concept called BANANA (Built-Absolutely-Nothing-Anywhere-Near-Anyone), which refuses to build anything in principle (Cossu 2006). This concept was surveyed in the context of the Czech Republic on the example of wind power plants by Frantál (2008) and Frantál and Kunc (2010, 2011). The links between recent agricultural changes and the increase of importance of energy productive farming (agricultural anaerobic digestion plants) were studied on the example of the Czech Republic by Dvořák et al. (2013) and Martinát et al. (2013c), or on the example of comparison between approaches applied in the Czech Republic and Slovakia by Martinát et al. (2013b). The recent trends in farming of the Czech Republic were studied by e.g. Věžník and Konečný (2011) or Tvrdoň (2011) in case of wider rural space.

## **Material and Methods**

In this study we are trying to discuss factors that influence the acceptance of anaerobic digestion plants on the local level. The previous studies focused on their acceptance by local population (Martinát et al. 2013c). In this paper we are concentrating on the opinions of mayors of communities where anaerobic digestion plants are located. As the first step of our research, we gathered communities where anaerobic digestion plants in the Czech Republic are located. The database of communities (a set of 243 communities as it was by the end of 2012) was developed according to the information delivered by the Energy Regulatory Office and compared to the information provided by the Czech Biogas Association. This step was followed by gathering contacts of the mayors of these communities – email addresses, phone contacts were all collected and during the spring 2013 all were requested to fill-in the questionnaire. The questionnaires were also gathered by phone calls and by personal visits in individual communities. Finally, 71 completed questionnaires were assembled, i.e. 29 % successfulness of returned questionnaires was reached.

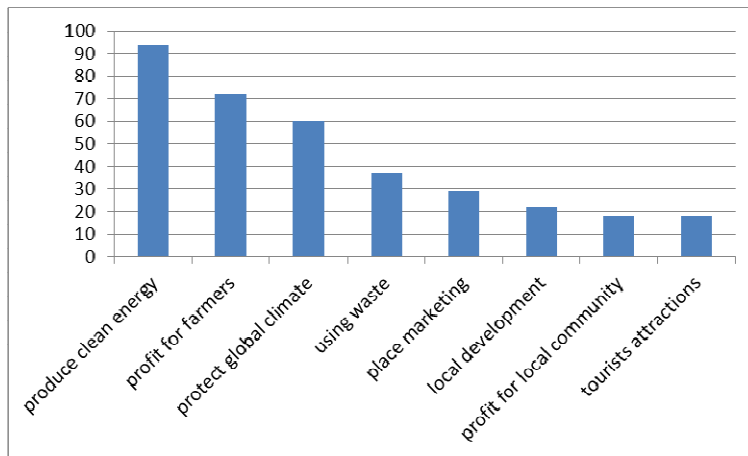
The authors are aware of the fact that results are strongly influenced by relatively low ratio of the returned questionnaires, on the other hand the authors are persuaded that the gathered information has despite the above mentioned facts its relevancy. The established pieces of knowledge might be important to identify potential barriers in the acceptance of anaerobic digestion plants by the representatives of communities, who play an important role in the decision making process concerning the location of such facilities. The mayors' opinions are important as well, since mayors play a significant role as opinions leaders within their communities. The questionnaire was developed on the basis of previous studies and researches (Frantál 2008, Frantál and Kunc 2010, 2011) and its final version was based on discussions with experts (three expert interviews with the operators of anaerobic digestion plants were carried out during January 2013). For the purposes of this study just one part of the questionnaire was utilized (3 of 15 questions).

## **Results and Discussion**

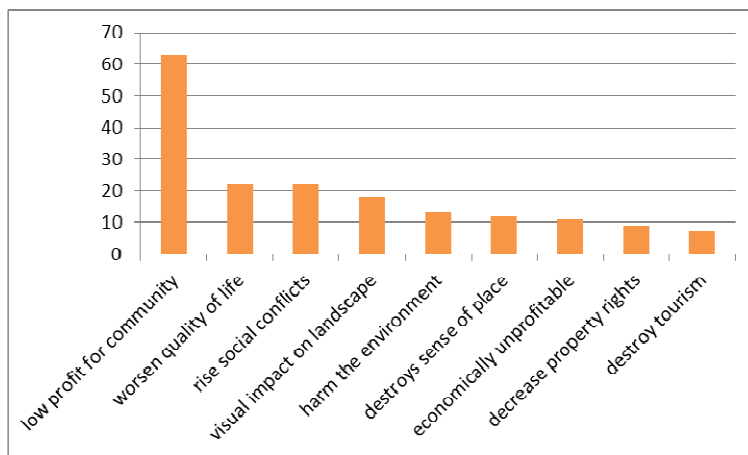
As indicated in Fig. 3, mayors evaluate the most positively impacts of anaerobic digestion plants like “facilities produce clean energy” (85 % agreed), “creates good profit to farmers” (72 %) and “protect global climate” (60 %). It seems that mayors are aware of the situation of farmers who are constantly looking for new (alternative) sources of income and find it in the production of green energy through anaerobic digestion plants. The economic benefit for farmers is here perceived as more important than “re-use of waste” (38 %) or the fact that supplies of cheap heat could undoubtedly “help to local development” (only 21 %). It is important that 18 % of answers considered anaerobic digestion plants as a tourist attraction (see Fig. 3), which is slightly in contradiction with the results learned from the perceived negatives (see below). We can summarize that the environmental benefits are perceived in a very much positive way and thus the environmental consciousness of mayors seems to be surprisingly high. On the other hand, the economic benefit for farmers is perceived in the context of the decline of traditional farming as a possibility how to economically survive the recent structural changes of farming in the Czech Republic.

As for the negatives (see Fig. 4), it is surprising that “low profit for community” is perceived as the most negative impact of anaerobic digestion plants (62 % agreed) of all mentioned. We can

conclude that if communities are more involved in the operation of such facilities, they might be perceived in a much better way. The benefits of such facilities (if operated properly) for rural development are indisputable (the possibility to supply community by cheap heat, processing of agricultural waste that would be left unused anyway etc.). The explanation for such choice could be the fact that the above mentioned benefits are utilized for rural development in reality in a very limited way. One of the surprising facts concerning the negative impacts is that more than 60 percent of mayors suggested low profit for community as the most important impact. Other choices were evaluated with much lower frequency (almost three times less). The mayors stressed these statements relatively less frequently than expected. This situation can be caused by improper use of the technology by the operators (expressed by spreading of smell in the location) or an increase of traffic in communities (the input material has to be constantly delivered to feed this facility). The case of social conflict might be represented by conflicts of interests of individual groups of population (newcomers/tourists vs. farmers/traditional population).



**Fig. 3.** Mayor's perception of positive impacts of anaerobic digestion plants in their communities (n=71, % of agreed answers); Source: own survey



**Fig. 4.** Mayor's perception of negative impacts of anaerobic digestion plants in their communities (n=71, % of agreed answers); Source: own survey

Next question of our survey was focused on the changing of overall evaluation of anaerobic digestion plants perception by local population in time before its construction (during planning of the

project) and nowadays, when it is in operation (reported by mayors, see Tab. 1). It is clear that attitudes of the majority of population is neutral in both cases, though a slight shift in time towards more positive attitudes (+10 %) creates a good precondition for further acceptance of anaerobic digestion plants. This might be caused by positive experiences with its operation, linked to both economic and environmental benefits.

**Tab. 1.** Changes in overall evaluation of anaerobic digestion plant in community by local population (reported by mayors, n=71)

	Mostly positive (%)	Neutral (%)	Mostly negative (%)
Before construction	29	64	7
Nowadays	39	52	9

Source: own survey

## Conclusion

The public acceptance of projects for the development of facilities that generate renewable energies might be labelled as a type of self-regulating mechanism that eliminates projects that raise increased economic, social or environmental controversies. This is, of course, based on condition that preparation processes of projects are sufficiently transparent and opened to enable participation of local actors in decision making process. It is a question open to debate whether and to what extent can active participation of local population be considered as a standard equipment of social capital of communities in the Czech Republic, or just a precondition that is expected but usually not applied in reality. One of the important elements of the perception of renewable energies in the Czech Republic is its bad reputation, which is caused, first of all, by the recent misleading and non-conceptual subvention policy towards renewable energies.

In the context of the obligation of the Czech Republic towards the European Union in which it is stated that 13,5 % energies will have been covered by renewable sources until 2020 (National Action Plan of the Czech Republic for Renewable Energies 2010), a further development of anaerobic digestion plants is expected in the near future. Despite the decrease of public support of these types of facilities for generation of renewable energies, their potential for rural development is indisputable (use of cheap heat, processing of agricultural waste etc.). It is a challenge to discuss how and by using which tools the gradual development could be influenced to be more suitable and appropriate for improving the quality of rural life. By setting the necessity to reuse waste heat? Or by setting the necessity to reuse agricultural waste? On the other hand, how to avoid manure “tourism”, which could cause more problems than benefits? It is clear that a consensus between economic profit and social and environmental benefits has to be kept to avoid the worsening of the quality of life of local population despite benefits for global environment in the form of greenhouse gases reduction. The local acceptance of projects for using renewable energies is a necessary precondition for their planning, preparation, implementation and further operation. It should be stressed that in the context of rather bad reputation of renewable energies among the public in the Czech Republic, anaerobic digestion plants are rather perceived as a further income for farmers than as a contribution to improve global environmental crisis that we are recently facing.

The attitudes of mayors of communities towards renewable energies are an important part of mosaic within the attitudes of local stakeholders, all of them influencing the location of this type of projects. Such piece of knowledge might contribute to better understanding of preferences, local contexts and specifics of individual localities. The presented study proved that in general anaerobic digestion plants were perceived more positively after their construction than before, when expectations of their impact are affected by not so good image of renewable sources of energies in the Czech Republic. We can also point out that the most negatively perceived statement (“low profit for community”) creates an interesting sphere of activity for planners of subvention policies on the local level. Much more distinctive engagement of local community while planning renewable energies projects (use of produced heat etc.) could help to change this barrier to tool that could support rural development.

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### **Profituje venkov z existence bioplynových stanic? Pohled představitelů obcí**

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**Zhrnutí:** Význam obnovitelných zdrojů energie neustále roste. Výjimkou není ani Česká republika, pro kterou se nejjperspektivněji jeví jako zdroj obnovitelné energie zpracování biomasy. Příkladem zařízení zpracovávajících biomasu jsou bioplynové stanice, jejichž počet i instalovaná kapacita v posledním desetiletí výrazně narostla (v roce 2002 existovalo v ČR 11 stanic s instalovaným výkonem 4,19MW, kdežto na sklonku roku 2012 šlo již o 481 stanic s výkonem 363,24 MW). Je bez diskuse, že obnovitelné zdroje mají při srovnání s tradičními zdroji energie řadu pozitiv (patrných zejména na globální úrovni), jsou však spojeny i s řadou negativy, která mají více lokální charakter a potenciálně tak zhoršují kvalitu života místního obyvatelstva a mohou tak být a priori zdrojem negativních, zamítavých reakcí na plánovanou výstavbu takovýchto zařízení. Proto již při návrhu, jeho realizaci i v průběhu samotného provozu je důležitým faktorem úspěchu celého projektu stupeň akceptace místním obyvatelstvem i místní veřejnou správou.

Proces akceptace projektů týkajících se výstavby zařízení pro výrobu energie z obnovitelných zdrojů veřejností můžeme považovat za určitý typ samoregulačního mechanismu, který eliminuje projekty, jež vzbuzují ekonomické, sociální, nebo environmentální kontroverze. Tento proces může samozřejmě fungovat jen za předpokladu, že již přípravná fáze projektů je dostatečně transparentní, otevřená a umožňující participaci místních aktérů v rozhodovacím procesu. Postoje a názory starostů, jakožto představitelů obcí, na obnovitelné zdroje energie jsou podstatnou součástí mozaiky názorů, které ovlivňují akceptaci daného projektu místní komunitou.

Na základě dotazníkového šetření mezi 243 starosty obcí s bioplynovou stanicí, které proběhlo během jara 2013, bylo získáno 71 vyplněných dotazníků (s návratností 29 %), které mohou sloužit jako reprezentativní názor starostů na téma bioplynových stanic a jejich roli ve venkovském prostoru.



*Za nejpodstatnější pozitivní přínos bioplynových stanic bylo starosty označeno tvrzení „že bioplynové stanice produkují čistou energii“, „jsou přínosné pro zemědělce“ a „přispívají k ochraně globálního klimatu“. Tyto názory reflektují environmentální prospěšnost bioplynových stanic a zároveň upozorňují na fakt, že v kontextu poklesů rozsahu tradičních forem zemědělské výroby znamenají bioplynové stanice významný a stabilní zdroj příjmů pro zemědělce. Za nejpodstatnější negativum byl identifikován „malý přínos pro obec“, což může mít pak za následek horší pohled na bioplynové stanice v případě posuzování nových projektů. Východiskem je větší spolupráce mezi obcí a bioplynovou stanicí například v podobě využití odpadního tepla, které zůstává v současné době ve většině případů nevyužito, nebo zpracovávání a energetické využití biologicky rozložitelných odpadů (biologicky rozložitelný komunální odpad, odpady z údržby zeleně apod.). Z výsledků výzkumu je také patrné, že bioplynové stanice jsou vnímány pozitivněji po jejich výstavbě, než před ní, kdy očekávání jejich negativního dopadu na okolí bylo ovlivněno špatnou reputací tohoto typu obnovitelného zdroje energie mezi obyvateli ČR.*

**Obr. 1.** Rozmístění bioplynových stanic v České republice v roce 2012

**Obr. 2.** Možnosti přípravy a realizace projektů na výstavbu zařízení pro výrobu energie z obnovitelných zdrojů a konečný dopad na místní komunitu

**Obr. 3.** Starosty vnímány pozitivní dopady bioplynových stanic na jejich obec

**Obr. 4.** Starosty vnímaný negativní dopady bioplynových stanic na jejich obec

**Tab. 1.** Změny v celkovém hodnocení bioplynových stanic v obci místním obyvatelstvem

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