

Shale Gas Extraction in Poland in the Context of Sustainable Development

Wydobycie gazu łupkowego w Polsce w kontekście zrównoważonego rozwoju

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Abstract

In June 2010 Poland was electrified by the big news: the country claimed to hold the largest shale gas reserves in Europe. Following the enthusiastic approach of the government and extractive companies, the public discourse has focused on the expected economic and geopolitical benefits of shale gas extraction. Meanwhile, the broader context of sustainability tends to be neglected. Some recent references to sustainable development in the context of shale gas extraction in Poland indicate that this concept needs a more thorough understanding. This article explores the following three aspects of sustainable development that need to be considered in the discussions on shale gas extraction in Poland. (1) Will the extracted natural capital be replaced with other forms of capital to ensure the well-being of future generations? (2) Will the formal institutions ensure that extractive companies prevent and mitigate all real and potential negative effects resulting from shale gas extraction? (3) How will the contribution of shale gas extraction to human well-being and national wealth be measured? The above issues link to important theoretical considerations within the concept of sustainable development, such as the weak vs. strong sustainability dilemma, internalizing external costs, and sustainability indicators (e.g. greening the GDP).

Key words: shale gas, weak vs. strong sustainability, externalities, greening GDP, resource curse

Streszczenie

W czerwcu 2010 roku okazało się, że Polska może posiadać największe złoża gazu łupkowego w Europie. Entuzjastyczne reakcje rządu i firm wydobywczych ukierunkowały dyskusję polityczną na oczekiwane ekonomiczne i geopolityczne korzyści związane z wydobywaniem gazu łupkowego. Zaniedbano tym samym szerszy kontekst zrównoważonego rozwoju. Niedawne odniesienia do zrównoważonego rozwoju w kontekście wydobywania gazu łupkowego w Polsce pokazują, że koncepcja ta jest często nadużywana i wymaga głębszego zrozumienia. Niniejszy artykuł przedstawia trzy zagadnienia kluczowe z punktu widzenia zrównoważonego rozwoju, do których powinny odnieść się dyskusje na temat wydobywania gazu łupkowego. (1) Czy wykorzystany kapitał naturalny zostanie zastąpiony innymi formami kapitału, które będą mogły posłużyć jako podstawa dobrobytu przyszłych pokoleń? (2) Czy instytucje odpowiedzialne za zarządzanie procesem wydobywania gazu łupkowego zadają o to, by firmy wydobywcze zapobiegały i usuwały negatywne skutki procesu wydobywania gazu łupkowego? (3) Jak będzie mierzony wkład wydobywania gazu łupkowego we wzrost dobrobytu i bogactwa? Zagadnienia te nawiązują do podstaw teoretycznych koncepcji zrównoważonego rozwoju, takich jak rozróżnienie między słabą a silną koncepcją zrównoważonego rozwoju, internalizacja kosztów zewnętrznych oraz wskaźniki zrównoważonego rozwoju (np. zazielenianie PKB).

Słowa kluczowe: Gaz łupkowy, słaba a silna koncepcja zrównoważonego rozwoju, koszty zewnętrzne, zazielenianie PKB, przekleństwo zasobów naturalnych

Introduction

There is a need to discuss shale gas extraction, which is strongly promoted by the Polish government, from the perspective of sustainable development, as it is an overarching objective specified in the *Polish Constitution* and in major European Union (EU) documents (especially the *Treaty on EU*). The authors of a recent article on shale gas extraction and sustainable development published in *Problemy Ekorozwoju/ Problems of Sustainable Development* journal (Siemek, Nagy, Siemek, 2013) have initiated the debate but they also missed the most important issues that can potentially link shale gas extraction with sustainable development. My objective here is to contribute to this debate by raising three crucial issues:

1. Can we talk about sustainable development at all in the case of a nonrenewable resource extraction? And if yes, then to which concept of sustainable development do we refer?
2. How does shale gas extraction relate to internalizing externalities, a key issue from the point of view of sustainable development?
3. How should we measure the contribution of shale gas extraction to sustainable development?

Before we move to a more detailed presentation of these issues in the following sections, we first need to refer to how shale gas extraction has been framed in the public discourse in Poland thus far.

Since the U.S. Energy Information Administration published its report on worldwide shale gas reserves (U.S. EIA, 2011), within which Poland was indicated as one of the countries most richly endowed with this resource in Europe, Polish government has been the most ardent promoter of shale gas extraction in Europe. Even though our shale gas resources were later estimated much more cautiously (PGI, 2012), Polish politicians kept lobbying to promote shale gas extraction in the EU. In particular, they have insisted that little policy action on this topic is taken at EU level, leaving as many decisions as possible at the discretion of individual member states. Also, shale gas extraction has been referred to in the major recent strategic development documents, including the *Long-term National Development Strategy Poland 2030 (LNDS)* (Ministry of Administration and Digitization, 2013) and the *Strategy on energy security and environment* (Ministry of Environment and Ministry of Economy, 2012).

Interestingly, in the LNDS shale gas extraction is presented as one of the strategies for creating a green economy in Poland. In the time of international economic slowdown, green economy has recently dominated much of the sustainable development discussion as an opportunity to combine economic growth with environmental protection and social inclusiveness. Although multiple definitions of green economy have been put forward, they commonly empha-

size ideas such as focusing on well-being rather than GDP, respecting planetary boundaries and other ecological limits, resource and energy efficiency, protecting biodiversity and ecosystems, reducing poverty, justness between and within countries and between generations, participatory governance, green jobs, and internalizing externalities (Allen, 2012). Meanwhile, as we shall see in the following sections, discussions on shale gas extraction rarely refer to any of these principles and quite often contradict at least some of them.

The strategy on energy security and environment also indicates sustainable development and green economy as its overarching objectives. As part of its energy security component it promotes the development of new sources of energy, such as unconventional gas (including shale gas). It indicates a need to prepare and implement a transparent legal and regulatory setting for the extraction of unconventional gas and to further explore the potential of this fuel in Poland.

The government has also initiated revisions of a number of legal documents that refer to shale gas extraction, including the *Geological and Mining Act*, and created draft versions of several new laws, such as the new *Act on a Special Hydrocarbon Tax*. Many of these legal changes have also been linked with sustainable development in the official presentations made by government representatives.

Siemek's (et al., 2013) article fits into this discourse, with their main focus on presenting and discussing the prospects of shale gas extraction in Poland. However, although they raised many technological uncertainties, and in spite of the title of their article, they did not specifically refer to the sustainable development. After an extensive presentation of general aspects related to shale gas extraction, the authors suggested that further development in this area in Poland can follow one of the four scenarios, ranging from optimistic to pessimistic. The optimistic scenario assumes rapid development of shale gas extraction, with few administrative obstacles and high inflow of capital, and with high economic efficiency of extraction. The pessimistic scenario refers to *withdrawal of the most important investors from Poland, no capital support for Polish companies, ecological obstacles blocking gas exploitation in Europe, maximum lowering of Russian gas prices*. Although the authors did not provide more information on any of these potential scenarios, it is quite clear that the sustainable development in the case of their article refer to the challenges for the development of shale gas extraction, separate from the more general concept of sustainable development.

Polish authorities insist on a speedy development of shale gas extraction in Poland and see environmental regulations and protected areas as important risks to this development. Meanwhile, sustainable development involves long-term, strategic considerations, which should not be subdued to short-term interests.

As expressed by Robert K. Sweeney, chairman of the New York State Assembly Standing Committee on Environmental Conservation, shale gas extraction needs a broad analysis and this analysis needs time. *We need to appreciate what we're getting ourselves into (...) It's not just the pumping of chemicals into the ground or the air pollution, it's also the effect on quality of life – something as simple as truck traffic, which other states didn't consider when they issued permits. (...) There's a lot to this issue that argues for taking our time. The gas isn't going anywhere, so what's the rush? If we do it, we should do it right* (cited by Schmidt, 2011, p. 353).

Thus, in particular, with regard to sustainable development we should think about the long term and not discriminating the well-being of future generations, which brings us to the concepts of weak and strong sustainability.

Weak vs. strong sustainability

The classic definition of sustainable development – *meeting the needs of the present without compromising the ability of future generations to meet their own needs* (WCED, 1987) – emphasizes intergenerational equity. A long-lasting academic debate has attempted to operationalize this definition, focusing on how to ensure that future generations will be able to meet their needs (Żylicz, 2010). These issues have also been at the center of the discussions on sustainable energy, as interpreted by the International Energy Agency (IEA, 2001), and in the recent articles published in this journal. These discussions take into account that three types of capital are necessary to satisfy human needs: natural, human, and man-made.

Two extreme concepts have been formulated: weak and strong sustainability (Neumayer, 2003). The former suggests that future generations may not need the exact composition of the three types of capital and it will be enough to maintain the total stock of capital, thus allowing for substitution between its different types. The latter suggests that all types of capital are necessary, and that one type of capital cannot substitute for another.

Clearly, shale gas extraction (just like the extraction of any other nonrenewable resource) cannot be called sustainable if one follows the strong sustainability concept (Kronenberg, 2012). It is unsustainable as once a resource is exploited, this resource is no longer available for the future.

However, following the logic of weak sustainability, benefits from resource exploitation might be used to generate other forms of capital that would replace the initial resource's potential of contributing to further development. From this perspective, depleting shale gas resources should be offset by investment in other forms of capital to be left for future generations. The concept of weak sustainability refers to the so-called Hartwick rule of substituting man-made for natural

capital (Hartwick, 1977, 1978). In practice, it is often associated with the concept of genuine savings, an adjusted measure of savings taking into consideration the depreciation and depletion of different assets, including natural resources (Hamilton, Bolt, 2007).

The World Bank collects genuine (or *adjusted net*) savings data, which incorporate gross national saving and education expenditure, reduced by consumption of fixed capital, depletion of energy resources (including shale gas resources), depletion of minerals, net depletion of forests, and damages related to CO₂ emissions and particulate pollution. Thus, using the World Bank's practical solution, to fulfill the weak sustainability criterion, the depletion of shale gas resources should be compensated by increased savings or education expenditure. Surprisingly, as the World Bank data demonstrate, many resource-rich countries actually have negative genuine savings rates. Indeed, the tendency to consume rents increases with resource dependence which complies with research in the area of the so-called resource curse (Atkinson, Hamilton, 2003; Dietz, Neumayer, De Soysa, 2007).

This negative relationship between resource abundance and a negative rate of genuine savings requires further scrutiny as yet another risk related to sustainable development in the context of shale gas extraction in Poland. Indeed, the weak sustainability concept is further confounded by additional circumstances, such as quality of institutions. For example, in countries with poor institutions and large corruption, the benefits generated by extraction projects may be captured by the powerful elites or other stakeholders (Mehlum, Moene, Torvik, 2006a, 2006b; Robinson, Torvik, Verdier, 2006). In particular, these benefits may not be available to local communities that suffer most from the initial resource being exploited or degraded. These issues are related to the so-called resource curse hypothesis and have also been studied in the case of potential shale gas extraction in Poland (Kronenberg, forthcoming). While both strong and weak sustainability concepts have been criticized, for being excessively rigid and loose respectively, several intermediate solutions have been put forward to make sustainable development operational. For example, Daly (1990) suggested that nonrenewable resource extraction projects should be complemented with investment in the use of renewable resources, and the rate of depletion of nonrenewable resources should correspond with the rate of development of renewable assets. Meanwhile, in Poland the introduction of the *Renewable Energy Resources Act* has already been delayed by three years, failing to meet the EU requirements and revealing the lack of political will to promote the development of renewable energy in the country.

The above sustainability-related issues have only been discussed to a very limited extent in the context of shale gas extraction in Poland. The draft revised

Geological and Mining Act presented by the Ministry of Environment in February 2013 foresaw the establishment of a Generations Fund (*Fundusz Pokoleń*, 2013). This fund was meant to collect part of revenue of a state-owned company that would become part of the extractive consortia (NOKE) and invest it in safe and profitable assets. The decision on the percentage of revenue was to be made by NOKE but so far no references were made (either in the draft document, nor in the surrounding discussions) to connecting this percentage with the value of reduction of natural capital available for future generations. Nevertheless, one of the fund's objectives is to ensure intergenerational equity, interestingly by supporting the pension system. The other two objectives include supporting innovative potential of Polish economy and protecting human health and life. At a very general level, the notion of such a fund was also mentioned in the LNDS.

Alternatively, future development opportunities might emerge if Poland becomes a European leader in the extraction of shale gas and if Polish companies develop technologies that could later be used to exploit shale gas resources in other European countries. Such a potential strategic advantage of Polish companies was indicated in the strategy on energy security and environment (*Ministry of Environment and Ministry of Economy*, 2012).

Nevertheless, much discussion so far, has argued against the concept of sustainable development. For example, Siemek (et al., 2013, p. 103) proposed that *No additional taxes can be now levied on industry owing to considerable uncertainty in the conditions of production. In the initial period tax preferences should be introduced for companies in this sector, analogous to the USA in the 1990's*. As argued above, these taxes and other payments are necessary to at least attempt to follow weak sustainability and have funds to invest in future development opportunities. Taxes may also be used as an incentive for extractive companies to minimize and mitigate the negative external effects of their activities.

External costs

Another key issue within sustainable development relates to costs which are not borne by those who cause them, i.e. external costs. These can be considered both within a single generation, and in an intergenerational context with future generations not able to protect their interests from the impacts caused by the current generation (Kronenberg, Bergier, 2010). External costs are not reflected in the prices of goods and services traded in the market, leading to consumer decisions being made in the situation of imperfect information. These costs are thus borne by the society as a whole, including local communities where a given activity takes place and future generations.

In the case of shale gas extraction, external costs are mostly related to nuisances for local populations, some of which can also extend to future generations. Examples of negative external effects related to shale gas extraction include increased traffic, vibrations, odors, landscape degradation, as well as noise, air, and light pollution and other environmental risks (Schmidt, 2011; Christopherson, Righthor, 2012; Kavalov, Pelletier, 2012; Broomfield, 2012). While new technologies, such as dry fracking within which gas is pushed out of shale rock with the use of other gas and not any kind of a fracking fluid, can solve some problems (e.g. water use and the risk of water contamination), they still involve other of the above-mentioned externalities. Some of the local externalities can be directly translated into monetary costs, such as the costs of repairing road infrastructure destroyed by traffic related to shale gas extraction. In the case of other externalities, non-market valuation techniques can be used to estimate the related costs. One of the aspects studied in this context was the loss of real estate value around shale gas wells. In the United States, a hedonic pricing study carried out in Washington County, Pennsylvania found out that the perceived risk of groundwater contamination led to a 24% reduction in property values within close vicinity of the shale gas well (Muehlenbachs, Spiller, Timmins, 2012). Similar results for the same county were reported by Gopalakrishnan and Klaiber (2013), according to whose study the reduction in property values within close proximity to shale gas wells was 21.7%. These reductions offset potential gains to house owners from lease payments or potential new economic opportunities related to shale gas extraction.

Another example of an attempt to capture the value of externalities related to shale gas in the US involved a choice experiment to estimate the willingness to pay for electricity generated with shale gas (natural gas from hydraulic fracturing). A study based on a sample of 515 households from 27 different counties in New York State indicated that its residents exhibited a negative willingness to pay for that electricity source (Popkin et al., 2013). They would only accept this kind of electricity had it been 22 to 48 USD cheaper than what they currently paid for electricity (124 USD on average). Higher compensation levels were required by people living closer to shale gas extraction sites. Another study used a contingent valuation method to estimate the residents' willingness to pay for eliminating the risks of water pollution due to hydraulic fracturing (Bernstein, Kinnaman, Wu, 2013) in Susquehanna valley in Pennsylvania (based on a sample of 186 residents). Local inhabitants were willing to pay on average 10.46 USD per month to install additional safety measures that would eliminate risks to local watersheds from shale gas extraction. Clearly, the socially perceived negative impacts of hydraulic fracturing are substantial. Although the situation in Poland may be very

different than in the US, similar distrust may emerge once extraction begins. Conversely, as a review of international studies suggested, consumers are generally willing to pay higher prices for electricity generated with renewable resources (Menegaki, 2008). One more example of external costs related to shale gas extraction refers to pushing some other companies out of the market. This may be related to the fact that the extractive sector competes with other sectors for labor and, to a much lower extent, for capital. Even more importantly, the extractive sector may compete with other sectors for access to space, thus competing mainly with sectors that depend on other resources provided by the same areas within which extractive activity is to be located.

Such a competition was studied in the case of the impacts of shale gas extraction on tourism in the Southern Tier region of New York State in the US (Rumbach, 2011). In the short term, the employees of the extractive industry can use the tourist infrastructure and thus might have a positive impact on the tourism sector (especially on lodging and food subsectors). However, they also compete with the traditional guests of this sector limiting availability and raising prices, making the latter less interested in visiting a particular region. More importantly, shale gas extraction may negatively impact natural resources on which tourism depends. This refers principally to landscape degradation (changing rural into industrial landscapes) and environmental degradation (or at least the perceived risk of environmental degradation). Moreover, local and regional tourism relies mostly on local labor while the extractive sector often hires specialized employees from outside of the region.

In fact the nuisances for local communities in Poland may be even more pronounced because, unlike in the US, land owners are not entitled to share the income from resource extraction. Thus, they have smaller incentive to have extractive activity in their land and directly suffer from nuisances. While in some other EU countries, such as France and Sweden, the state is obliged to pay a certain share of payments it receives from extractive companies to land owners (Pearson et al., 2012), such solutions have not been considered in Poland. Instead, Polish authorities introduced an opportunity to expropriate those who would not sell or otherwise consign their land for the purposes of shale gas extraction (Art. 19 of the *Geological and Mining Act*, as enforced since 1 January 2012). Public consultations related to shale gas exploration are usually treated as public relations campaigns by both individual investors and public authorities. Instead of a dialogue and a focus on the needs of local communities, such processes offer ready information sets and standard sponsoring opportunities that are meant to compensate the most apparent nuisances.

Environmental effects of shale gas extraction can also be associated with global externalities, such as

greenhouse gas (GHG) emissions. Howarth (et al., 2011) published the first comprehensive life cycle assessment of shale gas GHG emissions and concluded that shale gas GHG emissions were at least 20% and perhaps more than twice as large as those of coal when compared over a 20 year horizon, and comparable to coal when compared over 100 years. Several later studies (Jiang et al., 2011; Hultman et al., 2011; Burnham et al., 2012) suggested that shale gas life cycle GHG emissions were not as high as those calculated by Howarth et al. (2011). However, the variability of assumptions made in the various studies has been very significant. Such variability can be explained by the fact that due to the relatively recent development of shale gas activities and to the lack of systematic and compulsory measurements, an important paucity of reliable data currently restricts our ability to correctly and fully assess shale gas GHG emissions (c.f. Füllemann, 2012). Results obtained in the different studies are therefore strongly dependent on highly uncertain parameters and on specific data used and assumptions made by the authors.

GHG emissions, and especially the most important fugitive methane emissions occurring during shale gas operations, can be mitigated with solutions such as flaring, green completions, leak monitoring, additional controls, maintenance and repair. Differences in results of these studies highlight the importance of defining specific legislations in order to strictly limit GHG emissions. They also highlight a need for adopting a precautionary approach to shale gas operations, especially in light of the high uncertainty with regard to its environmental impacts.

GDP growth as a dominant measure of development

In the public discourse, GDP is broadly used as a proxy measure of development, and many of the discussions on shale gas in Poland focus on its potential to boost GDP growth. Interestingly, the case of shale gas in Poland may very well illustrate the pitfalls of associating GDP growth with development, and sustainable development in particular. Or, in other words, it may illustrate a need for a more comprehensive indicator of sustainable development.

GDP measures the scale of economic activity in a country by summing up the value of all registered economic activities carried out within a given period (or the value of all registered expenses). It does not include things that contribute to human well-being or national development, other than goods and services which are available through the market. For example, energy efficiency, which is often indicated as the most important freely available source of energy, is not given much attention in the discussions on energy future in Poland, even though the energy intensity of Polish economy is over three times as high as that of the most advanced EU countries. This is the

case because energy efficiency does not contribute to economic growth and thus remains outside of most of the political and economic discourse. Finally, GDP does not account for potential hindrances to well-being or development, such as the abovementioned externalities which by definition are not captured by the market.

Extraction of shale gas may accelerate GDP growth but its impacts on human well-being or national development are not equally evident. As argued above, GDP increases as we deplete a resource, thus – *ceteris paribus* – precluding future development opportunities. Furthermore, shale gas extraction also involves a number of so-called *defensive expenditures*, which have to be paid to avoid the deterioration of well-being. For example, expenditure on road infrastructure repair following the degradation of this infrastructure caused by extractive operations only aims at recreating the previous state of human-made capital. Even though the utility of this infrastructure is only comparable to the original state, GDP increases. Inconclusive results on shale gas extraction impacts on human health (Schmidt, 2011) and the defensive expenditure related to avoiding or mitigating health or environmental problems provide examples of similar uncertainties.

One more aspect of well-being related to shale gas extraction is the distribution of income from this activity. Again, this refers to how the benefits of extractive activity will be distributed between the current and future generations (whether they will be used to replace the resource's potential to satisfy future needs), and also to who will benefit from extraction within the shorter time frame. With regard to the latter, it is necessary to explore whether extractive activity will contribute to higher concentration of income (increasing the Gini coefficient of income inequality) or whether the benefits will be distributed more evenly within the society.

In short, putting shale gas extraction within the context of sustainable development requires further attention to broader aspects of development than just material and market wealth as measured by GDP. This is also in line with the concept of green economy which, as indicated above, emphasizes the idea of moving beyond using GDP as a measure of progress and welfare. Instead of GDP, more comprehensive measures of environmental, social and economic well-being should be used, the most immediate alternative being a revised, green GDP, which accounts for the above shortcomings of traditional GDP (c.f. Żylicz, 2010).

Discussion and conclusions

In spite of some references to shale gas extraction in Poland in the context of sustainable development,

the above three crucial issues: weak vs. strong sustainability, external costs, and misuse of GDP as a measure of development have not been addressed in this context.

In particular, perceived abundance of shale gas in Poland strengthens a false sense of security, based on an assumption that this resource will ensure future development opportunities. Such a false sense of security leads to downplaying the risks that refer to various aspects of sustainable development (economic, social and environmental). It is also related to a push for quick exploitation, despite the fact that Polish institutions are not yet prepared for managing shale gas extraction¹ and starting exploitation too early may even delay or remove the pressure to reform those institutions.

Meanwhile, supporters of shale gas extraction deplored what in their opinion was a slow development of shale gas sector in Poland and complained about further potential requirements to be introduced by the revised *Geological and Mining Act*. As indicated above, sustainable development requires taking the long term into consideration and thus requires well-thought decisions and regulations. Too many examples are available of resource rich countries which have not been able to translate their resource wealth into development prospects precisely because of poor institutions (Mehlum, Moene, Torvik, 2006a, 2006b; Robinson, Torvik, Verdier, 2006) to repeat their mistakes now.

The discussed author suggested that *The supervision of drilling operations by the State Mining Authority and General Department of Environmental Protection seems to be sufficient in this case*. However, environmental risks tend to be neglected much more broadly in Poland, in spite of their importance in the international academic and practical debate on shale gas (Kavalov, Pelletier, 2012; U.S. EPA, 2012; Broomfield, 2012). Polish Ministry of Environment ascertained that the process of shale gas extraction is safe for the environment, based on the results of a single study carried out for an exploratory drilling in Łebień (*Ministerstwo Środowiska*, 2012). Such a decisive statement, repeated by the representatives of the Ministry on many occasions, is rather surprising, especially taking into considerations the assumptions and reservations expressed in the report on which it was based (PGI, 2011). Interestingly, in the public discourse and even in official reports of government agencies one can find statements suggesting that addressing environmental issues represents a *negative propaganda*, creating a risk of blocking the development of shale gas extraction (Taras, 2011, p. 14). This brings about an important issue of whether Polish authorities will be able to ensure the level environmental control and supervision sufficient to prevent problems related to shale gas extraction.

¹ For example the distribution of exploration licenses was done hastily, on the first come, first served basis, without ensuring the proper control over who received them and

whether the licensees would actually be able to use those licenses themselves.

The perceived *environment or development* dilemma is perhaps the most important barrier to sustainable development in Poland (Kronenberg, Bergier 2012). Environmental protection is broadly seen as an obstacle to development, both in terms of regulations and protected areas. Clearly, this results from the prevailing focus on economic growth and neglecting other aspects of human well-being. Meanwhile, without protecting the interests of all inhabitants (including preventing nuisances for local communities and future generations), the externalities of shale gas sector (in particular shale gas extraction) may undermine the sustainable development of the country. To address the challenges of sustainable development in Poland in the context of shale gas extraction, one would need to address the above issues of: how to ensure development opportunities for future generations (weak vs. strong sustainability), how to deal with externalities, and how to measure the contribution of shale gas to sustainable development. These issues have not been discussed so far, and indeed it is not easy to present the extraction of a nonrenewable resource in the context of sustainable development. Some publications and the official strategies (Ministry of Administration and Digitization, 2013; Ministry of Environment and Ministry of Economy 2012), raised confusion by linking shale gas extraction with sustainable development and green economy without addressing the abovementioned crucial issues.

This example highlights a need for further education on sustainable development in Poland which should result in a clearer understanding of this concept. Thanks to education, the phrase should not be misused and abused as much as it has been misused and abused so far. Sustainable development should not be a catchword that everyone extends to their own meaning as it already has a well-developed theory and understanding in academic literature.

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