

TRANSFER TO DIGITAL ACCOUNTING FOR SUSTAINABLE FINANCIAL MANAGEMENT IN UNSUSTAINABLE EXTRACTION OF ENERGY RESOURCES

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ABSTRACT. Nowadays, in the conditions of increasingly stronger climate changes, the dynamics in economic life, in the industrial and social sphere on a European scale and a national dimension all determine the unsustainable extraction of energy resources and raw materials.

Moreover, the influence of the military actions in Eastern Europe, the emigrant pressure on the European Union, especially expressed in Bulgaria, and other political, social and economic factors in this country are prerequisites for instability and uncertainty in one of the key sectors of the economy - the mineral and raw materials industry, in particular in the extraction of energy resources.

In this environment, the issues of efficiency and flexibility of accounting, and of the stable financial management in the extraction of energy resources and raw materials acquire particular importance in state institutions and enterprises, as well as in private business.

In what directions can digital accounting contribute to innovations needed today in the financial management of the unsustainable extraction of energy resources and raw materials? The present article is devoted to the answer to this question, against the background of a brief review of the extraction of raw materials and energy resources in Europe and Bulgaria since the turn of the century.

Key words: energy resources and raw materials, extraction, digital accounting, financial management.

ПРЕХОД КЪМ ДИГИТАЛНО СЧЕТОВОДСТВО ЗА УСТОЙЧИВО ФИНАНСОВО УПРАВЛЕНИЕ ПРИ НЕУСТОЙЧИВ ДОБИВ НА ЕНЕРГИЙНИ РЕСУРСИ

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РЕЗЮМЕ. В наше време, в условията на все по-силни промени в климата, динамиката в икономическия живот, в индустриалната и социалната сфера в европейски мащаб и национално измерение, обуславят неустойчив добив на енергийни ресурси и суровини.

Освен това влиянието на военните действия в Източна Европа, емигрантският натиск върху Европейския съюз, особено изразен в България, и други политически, социални и икономически фактори у нас, са предпоставка за нестабилност и несигурност в един от ключовите сектори на икономиката – минерално-суровинната промишленост, в частност в добива на енергийни ресурси.

В тази среда въпросите за ефективността и гъвкавостта на счетоводството и стабилното финансово управление при добива на енергийни ресурси и суровини придобиват особено значение в държавните институции и предприятия, както и в частния бизнес.

В какви насоки дигиталното счетоводство може да допринесе за необходимите днес иновации във финансовото управление на неустойчивия добив на енергийни ресурси и суровини? На отговора на този въпрос е посветена настоящата статия, на фона на кратък преглед на добива на суровини и енергийни ресурси в Европа и България от началото на века.

Ключови думи: енергийни ресурси и суровини, добив, цифрово счетоводство, финансов мениджмънт.

Introduction

The dynamics in the economy, in the industrial and social spheres on a European and national scale, in the conditions of highly pronounced climate changes and a number of political, social, and economic factors determine the unsustainable production and market of energy resources. This article provides a brief overview of the development of the mineral industry and the extraction of materials and energy resources in Europe and Bulgaria in recent decades.

The economic instability characteristic of Central and Eastern Europe under the influence of the military actions in Ukraine, the refugee wave, and the emigrant pressure on the southern borders of the European Union, especially expressed in Bulgaria, are prerequisites for uncertainty in one of the key

sectors of the economy: the mineral and raw materials industry, in particular in the extraction of energy resources.

Certainly in this dynamic environment in the economy, respectively in the extraction of energy resources, the need for stable financial management is increasing, not only in state institutions and enterprises, but also in private business.

For accounting, as an important part of financial management at all levels, the inevitability of improving its efficiency and flexibility arises. Not only due to the needs of fast, timely, most appropriate, and precise accounting procedures and financial transactions, but also as a tool/lever for accelerated development and realisation of the organisation's functions.

For traditional accounting, if it can meet these needs at all, it is a big challenge, and if it does, it will be difficult and slow. In this regard, the possibilities of digital accounting are much

greater, conditioned by its many advantages. The results of a study is published by Dimitrova (2023). Some of them which are the most important and applicable to the field of financial management of the extraction of energy resources are discussed in this article.

How these advantages have been selected and how to introduce and apply digital accounting is shown with an example model that can be adapted according to the specifics of the given case in practice.

1. Brief review and picture since the turn of the century of the European energy resources and raw materials sector, in particular the Bulgarian sector

The state of the mineral industry, in particular the extraction of energy resources and raw materials in Europe and specifically in Bulgaria since the beginning of the century, has been quite dynamic. To some extent, it is representative on a European scale and more so in the Balkan region. This similarity between the countries is determined by the related social processes in the public space in and around Europe due to the increased and increasing mobility of people, especially of the past 1-2 generations, and to a greater extent by the interconnectedness of economies not only between neighbouring countries, but also on a continental scale as well as beyond.

For instance, the data from “Monitoring report on progress towards the SDGs in an EU context” (2023) devoted to the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs), adopted by the United Nations (UN) in September 2015. As the world’s roadmap for achieving sustainable development in this decade, it has determined “moderate progress” for the SDG 12 ‘Responsible consumption and production’, including extraction of resources and materials for the past five years, as is shown in Figure 1.



Fig. 1. Overview of EU progress towards the SDGs over the past 5 years, 2023

This goal (SDG 12) is linked with the EU’s material footprint, which estimates the global extraction of resources and materials induced by the demand and the consumption of goods and services within the EU. The extraction was on the rise until 2019, but fell in 2020 alongside the reduced economic activity caused by the pandemic. During this period and especially after that, SDG 9 ‘Industry, innovation and infrastructure’ has been

characterised with more favourable trends in most of its indicators, including the consumption of the resources and materials of the EU’s industrial sector. Therefore, SDG 9 is shown on a little bit better position better position on Figure 1.

The sustainability of the industry in these conditions in Europe was relatively little shaken and yet substantially influenced by the pandemic, as is shown for the production in industry in Figure 2.

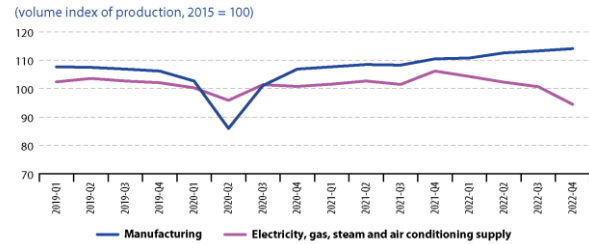


Fig. 2. Production in industry, EU, 2019–2022

Another important factor for the European dynamics, in particular for the extraction and consumption of resources, is the EU’s fallen energy import from Russia after its invasion in Ukraine (Monitoring report on progress towards the SDGs in an EU context, 2023), shown in Figure 3.

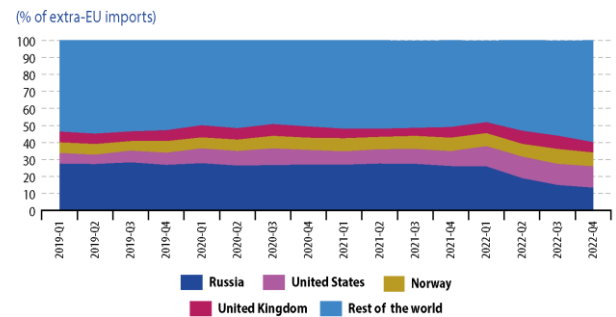


Fig. 3. EU imports of energy products, by partner, 2019–2022

Despite these variations, the resource and energy productivity have increased in the EU over the last decade. Very indicative of the European level of extraction and consumption of raw materials and energy productivity and production are Figure 4 and Figure 5 (ibid).



6.11
billion tonnes
of globally
extracted raw
material were
consumed in
the EU in 2020

Fig. 4. Raw materials’ consumption



In 2021, the
EU’s energy
productivity
amounted to
8.5
EUR per kgoe

Fig. 5. EU energy productivity

The observed trends for energy productivity are stronger than for resource productivity, due to a larger decreases in energy consumption than in material use. Between 2016 and 2021, the EU increased its energy productivity by 9.1%, from EUR 7.8 per kg of oil equivalent (kgoe) to 8.5 EUR per kgoe.

The state and dynamics of the mineral raw materials industry in Europe (ibid) since the beginning of the century is illustrated in Figure 6. For individual countries, with a focus in the case of Bulgaria in Figure 7, a relatively moderate increase is characteristic compared to the large growth of this consumption in, for example, Malta, Cyprus and Lithuania. In other countries, such as Austria and Luxembourg, the consumption of raw materials decreased significantly during the studied 5-year period.

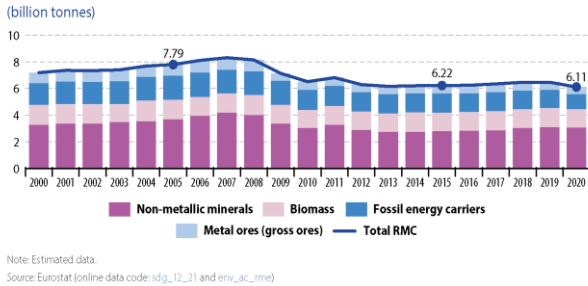


Fig. 6. Raw material consumption, by material, EU, 2000–2020

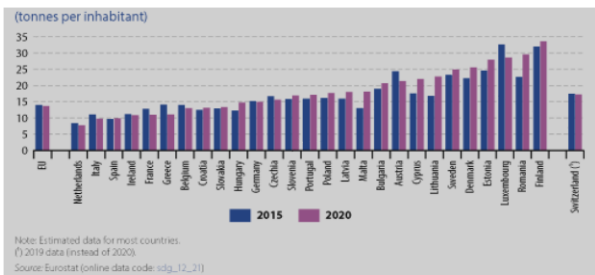


Fig. 7. Raw material consumption, by country, 2015 and 2020

Very indicative for the degree of dynamics of the market of energy resources is one example with an actual fresh picture during the past several months, shown in Figure 8 - the degree of dynamics of crude oil prices depending on the "strength" of the dollar during interest rate fluctuations from the European Central Bank and a standstill by the Fed. Two months earlier, the price of Brent crude was falling from around \$87.5 to \$72.5 a barrel, but in the past week it increased by 3.4% to \$75.67 a barrel (Daily Energy Market Update, 2023).

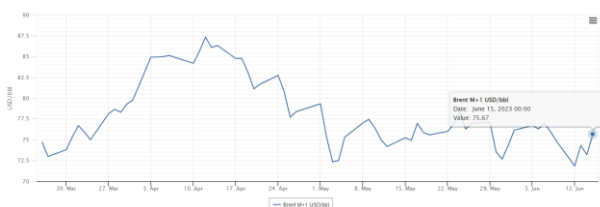


Fig. 8. Dynamics of the market of energy resources / crude oil price, 2023

In all cases, the theme for the dynamics of the extraction and consumption of resources should be considered in environmental and also in climate aspects.

It can be said, on the one hand, that this complex situation of an affected economy and reduced resource extraction has a positive result in reducing the environmental impact. But on the other hand, this effect is mainly related to the priorities and efforts of the European commission, especially the "European

Green Deal". In particular, the Green Deal Industrial Plan (2023) seeks to enhance the competitiveness of Europe's NetZero industry and support the fast transition to climate neutrality.

Figure 9 shows air emissions intensity of industry for particulate matter. As seen in the chart, on a national scale in almost all European countries, with the exception of Serbia and Iceland, emissions are reduced compared to 2015. For Bulgaria, the degree of this is comparable to other Eastern European and Balkan countries.

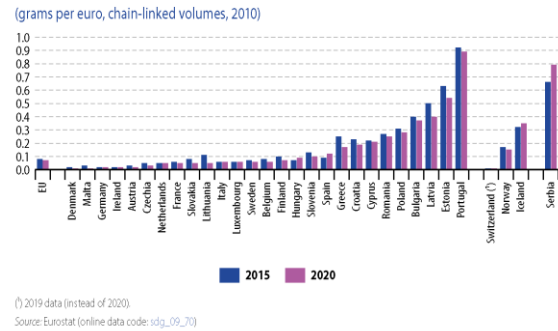


Fig. 9. Air emissions intensity of industry for particulate matter (PM2.5), by country, 2015 and 2020

Let us consider one more aspect: the picture of 2023 of the extraction of energy resources in Bulgaria with the news from 7 Apr 2023. The data are published by Nikolov (2023) - it is shown as an illustration in the caption to Figure 10 - photo from EnergyMarketPrice (Daily Energy Market Update, 2023), related to the news on 15 Jun 2023.



Fig. 10. "Bulgaria risks €10 billion over coal addiction"

And a longer quote: "Bulgaria risks losing €10 billion as politicians continue to be reluctant to carry out reforms for the Green Transition, a move that would ensure Bulgaria continues to produce polluting and expensive electricity from coal and stays uncompetitive".

Yes, this quote is just one example, but at the end of this short review, it can undoubtedly be said that the situation with the mineral industry, in particular the extraction of energy resources in Bulgaria, is very complex from the economic, political, and social aspects.

This brief review and analysis of the development of the extraction of raw materials and energy resources in Europe and Bulgaria since the beginning of the century, of course, is not comprehensive. These could be much more detailed and comprehensive, but in this case they are sufficient as a basis for presenting the role and possibilities of digital accounting for better financial management by this dynamic development of the mineral and raw materials industry.

2. Essence and applicability of digital accounting in financial management under the conditions of unsustainable extraction of energy resources and materials

Before talking about the nature and advantages of digital accounting (DA), let's show some links which could be considered for illustrating its popularity in various fields of activity recently:

- The DA is part of digitalisation and its impact on the activity of industrial enterprises (Chudaeva et al., 2018).
- The DA could be attributed to the process of formation and development of innovations, for example in the enterprises in Bulgaria (Nikolov, 2019).
- The DA is considered in the context of digitalisation and strategic development of enterprises (Bulkina et al., 2022).
- The DA can even be linked to IoT challenges (Dutton, 2014).

After the traditional definition of "Digital Accounting" referring to the creation, presentation, and transfer of financial information in an electronic format (Fisher, 2020), there has been a great development to its modern essence. The advantages of the DA is are the subject of a number studies and publications (Dimitrova, 2023).

In order to consider and select the advantages of DA, let's choose the most important ones for the topic of this article, and first of all try to answer some key questions:

1). Why and how could the DA help for sustainable management of the energy resources and raw materials?

1.1. The DA is flexible

The DA' flexibility, especially if is organised to use software packages in digital accounting system realised as a cloud-based platform, is conditioned to let log into the system at any time and from anywhere. Practically that allows remote access to the financial data of the given organisation or company, permanently flexible and effective financial management, depending of the needs.

Flexibility is an extremely important characteristic to have in the conditions of unsustainable extraction of energy resources, as it allows:

- easily to increase or decrease the extraction of raw materials and of an energy resource depending on the needs;
- transition from frequently sought to less frequently sought resources that have become attractive resources, even if only in the short term;
- to move from rhythmic to dynamic mining in quantitative terms, so as to reflect as much as possible the variable demand of the market by types of resources;
- flexible approach to payments and other.

For example, if we focus on the question of how to implement a flexible approach to payments?

For this purpose, it can be recommended to categorise the customers/partners of the energy resources market by defining:

A - accurate, proven, trusted customers/partners – for them, flexible interest-free deferred payment can easily be secured through DA. Moreover, the approach to them may involve "crediting" higher quantities of supplied resources/raw materials and levelling the "balance" at a later stage (Figure 11)



Fig. 11. "Crediting" - "balance" at a later stage

B - uncertain customers - the approach to them is a higher share of advance payment for resources and a higher interest rate for late payments. In some cases, even "penalty interest rate" can be applied as a penultimate measure (the last is by court order), if it is legally enforceable and written in the contract. Of course, it must be accompanied by an inapplicability clause if conditions are subsequently met.

C - new customers - approach similar to **A** but not "interest-free deferred payment"; instead, "attractive deferred payment" - with a lower than market interest rate, until the balance of the "scale" is reached.

Given the subject of the article, the "flexibility" advantage of DA deserves some more attention. Flexible contracting with floating interest rate depending on the category of the customer of energy resources, and its transfer from zone A to zone B or back is shown in a sketch in Fig.12.

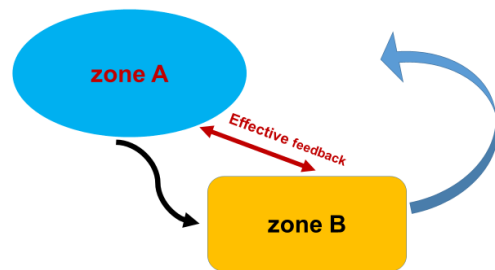


Fig. 12. Flexible contracting sketch

1.2. The speed of DA is high

This is an indisputable and significant advantage of DA compared to traditional accounting - at least several times faster accounting operations, especially emphasised in the several times more complex payment schemes for "flexible contracting and supplies", noted above.

1.3. Certainty is guaranteed

It is guaranteed in a high degree with a differentiated approach to negotiation and delivery to the different categories of counterparties (A, B, C).

2). Why and how could the DA contribute to the stabilisation of the energy resources extraction?

2.1. The use of DA can contribute to the calming, even to the growth, of the extraction of energy resources and raw materials, because:

- payments will be stabilised through easier invoicing and payment tracking, prevention of delays and duplication;

- through DA, it is possible to react to price fluctuations on the market of energy resources and raw materials much faster compared to classical accounting;
- through DA, the balance discussed above will be reliably and precisely achieved, and the financial status of the company extracting energy resources and raw materials will be updated in a timely manner, depending on the demand and supply on the market.

2.2. When using DA in financial management, reliability and scalability are very good because:

- the influence of the human factor is reduced, the errors made in traditional accounting practices are avoided even when people provide accurate data and are careful and diligent in their work;
- very accurate results are achieved thanks to DA's automated software, which makes it undeniably much better, even more so with the dynamics in the scalability of the transactions of the company extracting energy resources and raw materials with its clients, thus ensuring high reliability in the financial management.

3. Mechanism to introduce and apply the digital accounting in the energy resources and raw materials industry

When we talk about energy resources and raw materials industry and market, it is appropriate and expedient to consider the issue on a broader scale than the national one. In this case, it is appropriate to take into account the conditions in Bulgaria and the Balkan region, taking into account the market opportunities and interests both in the country and the exchange with neighbouring countries.

The research done in the field of digital accounting systems shows a variety of approaches and models for their implementation and use. In most cases, separate digital implementation is carried out in each individual organisation or company. There are various specialised software products, it is appropriate for larger structures and corporations to use, for example, the so-called management model for sharing accounting (Chen, 2021).

A sequence of steps can be outlined in a mechanism to introduce and apply the digital accounting in the energy resources and raw materials industry:

- i. First of all, it is necessary to study, characterise, and group the existing and potential new customers of energy resources or/and raw materials;
- ii. Next is the creation of a specific DA model for each group based on the selected most suitable software and preparation for its implementation in a suitable cloud platform;
- iii. Organising the implementation of the specific model for each group in communication with the cloud platform.

An example sketch of a model suitable to introduce and apply the DA in the energy resources and raw materials' industry in a state-owned enterprise is shown in Figure 13.

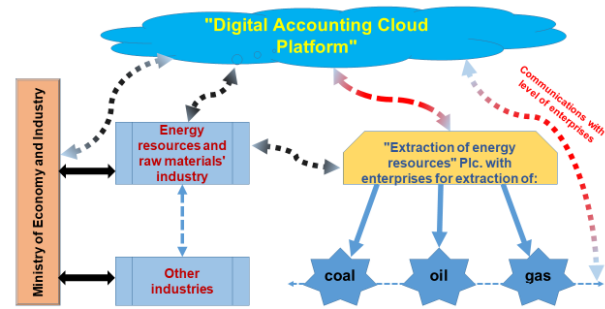


Fig. 13. Sketch of a model for apply the DA in the energy resources and raw materials industry

It is important to pay attention to the following features on the sketch:

- What is basic is the direct connection between "Digital Accounting Cloud Platform" and "Extraction of energy resources" Plc. for the implementation of digital accounting and financial management of the joint-stock company;
- the connection of "Digital Accounting Cloud Platform" with extraction enterprises is working parallel to the basic one for direct use of DA at the enterprise level. In this way, DA will meet "cloud information" with incoming accounting information from every enterprise, which will increase the degree of internal control, reliability, and security of financial operations and overall financial management of the Plc.;
- the connection of "Extraction of energy resources" Plc. with the direction of "Energy resources and raw materials industry" and from there with the Ministry of Economy and Industry is functionally with the possibility of digital accounting exchange if necessary;
- the direct connections of the direction "Energy resources and raw materials' industry" and the other directions (to a lesser extent also between the directions) are functionally in the Ministry of Economy and Industry;
- the links of the Ministry of Economy and Industry and the directions in it to/from the "cloud" are informative but potentially possible for digital accounting exchange if they are all unified as software in communication with this "Digital Accounting Cloud Platform".

Of course, this model is not presented as generally valid for the practice of extracting energy resources and raw materials, but as an example it can be adapted and applied to specific cases in the country.

4. Conclusion

In general, it can be summarised that this article demonstrates, on the one hand the possibilities and advantages of digital accounting over traditional accounting, especially in terms of flexibility, speed, accuracy, security, and reliability of accounting operations and financial management of a given organisation or company.

On other hand, the article develops on and argues on the importance of the introduction and use of digital accounting to improve financial management in one of the leading sectors of the economy and industry - the extraction of energy resources

and raw materials in Bulgaria, including with regard to their exchange with other countries, especially in the Balkan region and on a European scale.

This is done against the background of a brief review of the state and development of the sector over the years since the turn of the century in a European scope and with some indicators for Bulgaria. The dynamics and the real picture are shown, allowing an analysis of the unstable state in the sector in recent years, under the influence of military actions in the centre of Europe, the refugee wave, and the emigrant pressure on the southern borders of the European Union.

The article discusses why and how, under these conditions, the introduction and use of digital accounting can contribute to the stabilisation of extraction of energy resources and raw materials and to the improvement of financial management.

It also presents the mechanism and a model for applying digital accounting in a joint-stock company for the extraction of energy resources and raw materials, and the enterprises to it, with connections at the ministry level, based on the "Digital Accounting Cloud Platform".

The above is presented as an example that can and is recommended to be adapted, specified, and applied in given cases from the practice of the extraction of energy resources and raw materials in this country.

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