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BETWEEN SUSTAINABILITY, SOCIAL COHESION AND SECURITY REGIONAL DEVELOPMENT IN NORTHEASTERN ESTONIA*

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Abstract. In 2012, the European Parliament (EP) established Sulphur Emission Control Areas (SECA) in Northern Europe comprising the North Sea, the Baltic Sea and the English Channel where from 2015 ships are obliged to use bunker fuel with a sulphur content not exceeding 0.1%. Estonia is a maritime fuel producer due to its oil shale reserves in the North-Eastern parts of the country (Ida-Virumaa County). A large part of oil shale is used for the production of maritime bunker oil. Unfortunately, the sulphur content of oil shale is higher than it is allowed by the SECA regulations. The Estonian oil shale industry represents up to 5% of the national economy and plays an important role in a weakly developed Ida-Virumaa County, which shares a common border with Russia and hosts the majority of Russian-speaking Estonians. Approximately half of this regional workforce is employed directly or indirectly in this industry giving the oil shale industry an important role in the county's economic well-being. In addition, periods of low oil prices are putting extra pressure on the oil sector, which endangers the traditional business model of the Estonian oil shale industry.

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The research investigates the impact of the environmental regulations in the shipping sector on the socio-economic situation in North-Eastern Estonia and discusses political consequences for the region. The paper highlights possible regional development strategies for Ida-Virumaa County and their impact on sustainability, social cohesion and security issues in the context of the integration of Russian speaking Estonians into the Estonian society. Methodically, the research is based on expert interviews, a survey, a case study, and a further exploration of potential political options to improve the social coherence in North-Eastern Estonia.

Keywords: *social cohesion; security; regional development; sustainability; smart specialisation*

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Additional disciplines ecology and environment; environmental engineering; energetics and thermoenergetics.

1. Introduction

Around 90% of the world's cargo is transported by ships and are related to a high magnitude of harmful emissions comprising CO_2, SOx, ODS, VOC and NOx (Unctad, 2015; Jiang, L., Kronbak, J., & Christensen, L.P., 2014). Consequently, the International Maritime Organization (IMO) launched several clean shipping initiatives in order to harmonise emissions legislations among nations to force the shipping industry to operate with the cognisance of the environment. Sulphur emissions (SOx) especially was tackled by the "Regulations for the Prevention of Air Pollution from Ships" in the sixth annexe of the MARPOL (International Convention for the Prevention of Pollution from Ships) Convention of the IMO through the creation of the Emission Control Areas (ECA) with limits for different kinds of emissions in these areas.

In 2012, the European Parliament (EP) established Sulphur Emission Control Area (SECA) in Northern Europe including the Baltic Sea where ships must use low sulphur fuel content from 2015 and the limit must not exceed 0.1% (1,000ppm) (Directive 1999/32/EC amended in Directive 2012/33/EU; IMO, 2014). Despite the fact that only about 0.3% of the world's water surface represents SECA currently, the implementation of the regulations has spurred discussions on if or/and how they affect maritime stakeholders as well as the economy in the Baltic Sea Region (BSR). These discussions gained global interest because the Marine Environment Protection Committee (MEPC) of the IMO decided in October 2016 to reduce SOx content in bunker fuel worldwide to include both SECA and non-SECA to 0.5 % (5,000 ppm) from 2020 (IMO, 2016).

For Estonia, the introduction of SECA regulations represents an issue of national interest since Estonian oil shale industry is an important producer of oil shale, a maritime bunker fuel that contributes up to 5% of the national GDP and about €300 million to the state budget (including employment taxes, environmental taxes). The Estonian oil shale industry is concentrated in Ida-Virumaa County and plays an important regional role for a county, which is situated in the North-Eastern part of the country at the Russian border. Ida-Virumaa County represents an economic weakly developed region with about 150,000 inhabitants equipped with the highest unemployment rate in Estonia (13.2%, Estonia: 6.2%), a high labour pressure, a low average regional income (ca. 81% of Estonian average) and the highest concentration of the national majority of Russian-speaking Estonians (ca. 77%) (SYBE, 2016). Approximately half of the regional workforce is employed directly or indirectly in this industry so that changes in oil shale business will have direct socio-economic consequences (Olaniyi & Viirmäe, 2016). Since the fall of the oil prices in the second half of 2014, the Estonian oil shale has been under economic pressure, which was further amplified with the implementation of the SECA regulations since 2015. The Estonian maritime bunker fuel challenge increased because of oil shale high sulphur content of about 0.8%, which is higher than the SECA regulation limit of 0.1%w/w in the BSR as well as the 0.5%w/w global 2020 limit.

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After the Ukrainian crisis in 2014, the integration of the about 25% Russian speaking Estonians became a top issue on the political agenda in the Baltic States and within the NATO. Kivirähk (2014) pointed out that about half of the Russian minority is relatively and completely unintegrated into Estonian society but a higher quality of living in a prosperous, high-tech Estonia than their compatriots in Russia will assuredly bring a foreseeable future loyalty for Estonia their host country (Hockenos, 2015). This scenario might change, especially in Ida-Virumaa County, if the economic frame conditions are reduced especially when the oil shale industry link with the social cohesion in Estonia is considered (Prause & Olaniyi, 2017). Consequently, special reconciliation and counter-strategies to combat Russian propaganda in Central and Eastern Europe were initiated including also parts of NATO area with a focus on Russian speaking minorities in order to strengthen social cohesion and integration as instruments to safeguard the security and to prevent Ukrainian conditions (Pomerantsev & Lucas, 2016).

The paper addresses the following research questions: What are the political options for regional development for the Estonian oil shale industry and North-Eastern Estonia? How the economic and social cohesion in North-Eastern Estonia be kept in the context of sustainability and security. The authors participate in a European project on the assessment of the impact of SECA regulations on the Baltic Sea Region (BSR) so that the research is based on expert interviews, a case study from Estonian oil shale industry and a survey among regional development experts. The paper is organised as follows: after the introduction, there is the theoretical background of SECA and environmental regulations, Estonian oil shale industry, regional development, sustainability, national and political Security. The next section describes the system of methods used for this research followed by the result part, which comprises a case study from oil shale business and political options for North-Eastern Estonia. The findings and their implications are discussed and summed up in the last section which is followed by a conclusion.

2. Theoretical Background

2.1. SECA Regulations

The impact of sustainable transportation and green supply chain management have been intensively discussed among scholars so that before the introduction of SECA regulations in BSR in 2015 the tentative changes for maritime stakeholders in BSR have been an important issue (Rao & Holt, 2005; Hunke & Prause 2014; McKinnon et al. 2015). Notteboom (2010) estimated economic disadvantages from SECA areas to maritime stakeholders who have to comply with the strict environmental regulations competitors in other parts of the world are not subject to. The Institute of Shipping Economics and Logistics from Bremen (ISL, 2010) forecasted a disproportionally increase of maritime transport costs in SECA regions initiating a cargo shift from sea to land transport so that shipping companies and ports would lose handling volumes and income. Other discussions (i.e. Wiśnicki, et al., 2014; OECD/ITF, 2016) argued that the regulations would weaken the competitiveness of European maritime transport especially in the modal shift of cargo flows from marine transport to inland transport routes of which, the implementation costs to the maritime sector would be between €2.6 billion and €11 billion by 2020 (AirClim, 2011). However, after 2015, no such significant changes are witnessed and the vessels that operate in the Baltic Sea now use fuel that is low in sulphur content (Olaniyi et al., 2018).

There are also ongoing debates on the impact of governmental policies and regulations on national growth. Using the endogenous growth theory, Barro (1991) pointed out that regulations generally introduce distortions such as high tax rates, spending and heavy investments that do not provide compensating incentives but give room for the price and markets alterations that are investments deflators and negative to markets growth. Since productivity growth plays an important role in any economy, any distortions that adversely affect entrepreneurial activities have great significances for the growth of any economy (Solow, 1994). In the same light, Jaffe et al., (1995) argued that regulatory decisions are too time-consuming and are often characterised by litigation and other legal power struggles that last for decades of reforms with additional policies to the existing ones leading to what they

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called "transition costs". Regulatory interventions impact investment choices which ultimately have a great effect on the economy because the build-up of regulations over time often lead to duplicative, conflicting, and even contradictory rules, and the multiplicity of regulatory constraints complicates and distorts the decision-making processes of companies or stakeholders operating in such economy (Martin & Sunley, 1998). Affected companies usually respond to individual regulations and the accumulation by changing their strategies for innovation process and these activities are embedded in research and development (R&D), expansion, equipment upgrade and processes (Bourlès et al., 2013).

Rebelo (1991) claimed that regulations are the major cause of a decrease in productivity. New institutional economics theory postulates that the economic development of a country is governed by its institutions (also called "active rules" like laws, customs, and regulations) (Coase, 1998). This involves *transaction costs* or *enforcement of contract* which are expensive, reduce productivity and impose large direct and indirect costs on the stakeholders or more so at the society (Bourlès et al., 2013). This makes it imperative to balance the costs-benefits of any regulations by identifying and implementing pragmatic cost-effective regulatory instruments, whether conventional or market-based interventions because, the constant and avoidable expenses and investment could lead to societal waste (Blind, 2012).

However, Olaniyi and Prause (2016) explained that the innovation that stems from these activities is a key driving factor for economic growth and social wealth since innovative products and services emerge more often as a result of a cross-sectorial combination of technologies, design and business models. Solow (1994) clarified that irrespective of the distortion any regulation might bring, every economy depends on investments in knowledge creation like research and development and in the manner in which they lead to innovation to create productivity. Furthermore, economic competitiveness depends on strong links between research, innovations and actors in an industry (Prause et al., 2011; Olaniyi and Reidolf, 2015). This means that, theoretically, companies imposed by regulations are forced to invest more in the production process. While "production" of new technology, may require high financial input, they sometimes yield high returns. The impact of government intervention on economic growth does not only involve the direct and indirect costs associated with each regulation, but they can also at the same time create stability connected to wider macroeconomic benefits such as GDP increases, competitiveness and productivity effect. They also produce other intangible benefits like protection of fundamental rights, social cohesion, international and national stability the economic status of any nation (Renda et al., 2013).

Maritime fuel producers in recent times have been plagued with downward price fluctuations alongside the usual sector challenge of speculations and economic forecasts, conflicts in different parts of the world, production estimates from the oil-producing countries, stock levels, seasonality, weather and accidents (Nugraha, 2009). The positive side of oil shale industry is that recently the industrial sector gained increasing interest since after a long time of decline re-industrialisation and enjoys a renaissance on the Western economic agenda because politicians, business leaders and scientists are recalling the role of the industrial sector as a key driver of research, productivity, and job creation. This particular industry generates about 80% of the EU's private innovations and 75% of its exports (Prause, 2015, 2016).

2.2. North-Eastern Estonia and its Oil shale Industry

Estonian oil shale industry represents one of the most important national industries, which gives Ida-Virumaa County the highest industrial share in the regional GDP and an analysis of the statistical figures underpin the connection with innovation and exports. Kallemets and Tänav (2017) pointed out that for the Estonian innovation sector between 2012 and 2013, the Estonian oil shale sector was responsible for more than 15-20% of total Estonian R&D expenditure. Furthermore, the authors, using figures from Estonian Patent Office calculated that Estonian oil shale research yielded approximately 9% of all patents and 6% of all useful models granted by the

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patent office within this time. Furthermore, Kallemets and Tänav (2017) also highlighted the link between €25.9 million expenditure on R&D of Estonian oil shale companies between 2009 and 2015 to be related to €434.6 million worth of innovation led investments into the physical capital in the whole value chain of oil shale mining and processing. Thus, during that period, a multiplier factor of 13.2 between R&D and investments was observed. Finally, the authors stressed the high potential for the Estonian oil shale business for further value-added gains through R&D due to the opportunities the low sulphur maritime fuel production or in the blends with other crude oils in regular refineries spurred by the SECA regulations. In this case, R&D and innovation can help the upgrading of oil shale to higher value oil products with an increased value of the product by 30-40% necessitating investments of several million euros into upgrading units.

Interestingly, these aspects are not represented in the Estonian smart specialisation strategy. The smart specialisation approach is a decentralised coordination approach to public interventions for the support of innovation and structural change in Europe (Foray & Goenega, 2013). By investigating the regional development aspects, the smart specialisation strategy of Estonia has to be considered since the European Union stressed the principles of embeddedness and connectedness as criterions for fund allocation (McCann & Ortega-Argiles, 2013; Prause, 2014; Olaniyi & Prause, 2016). Regional innovation strategies for smart specialisation build on a region's capabilities, competencies, competitive advantages and the potential for excellence in a global perspective. One of the key concepts of the smart specialisation approach is the self-discovery or entrepreneurial discovery process so that smart specialisation is flanked by supporting entrepreneurial self-discovery as well as by fostering innovation activities in the different regions (McCann & Ortega-Argiles, 2013). To this end, the bottom-up development is paramount to the major objectives of regional policies, which are to tackle unemployment, increase economic growth and to decrease inequalities in a country and among countries (Olaniyi and Reidolf, 2015)

The Estonian smart specialisation strategy concentrates on three thematic fields using the ICT as an enabling instrument implemented horizontally in all sectors, health, and more efficient value-added use of resources (EAF, 2013). Three ICT sub-sectors, where the potential is highest, are the use of ICT in the industry (robotics), cyber security and software development. Health as a research field has been developed in the Estonian academic research environment over the last decade. The country offers several high-ranking research centres in this field and has relatively significant participation in international projects. Health as one of the key innovation fields is supported by various activities on the national and international levels. In this growth area, special attention is given to biotechnology (personal medicine) and e-medicine. The term resource efficiency, as used in the smart specialisation strategy, is used in a very broad way as it includes material science, housing, food and the chemical industry. In all those areas, the public research environment is an active partner in national and international research projects. Under the theme of the efficient use of resources, special attention is given to using resources efficiently and creating additional value-added.

2.3. Sustainability

Sustainable development (SD) is rooted in community values and future hopes and is the core for regional strategies creation (Coelho et al., 2012). A common paradigm subjected to diverse analyses and definitions and often used interchangeably with sustainability. The most cited definition of sustainable development was made in *our common future* report and defined as the process that ensures that the needs of the present are met without compromising future generation's ability to meet their needs" (WCED, 1987). Nessa et al. (2007) tried to differentiate sustainability and sustainable development by equating sustainability to the quality of life that must not jeopardise the future whereas sustainable development centralises on humans' right to a healthy and productive living for now and the future, making both definitions in principle the same.

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There are three pillars of SD namely: the economy, social and environmental sustainability (Moldan et al., 2012). Bringing to focus on how "harmony with nature" is imperative for human survival while equal enablement is made for today's resources as well as for future generation (Nessa et. al, 2007).

Preserving the economy has played a paramount role in diverse development discourse (Moldan, 2012). Linking productivity to labour and capital, Vallance et al. (2011) explained that high productivity is an indicator of profitable income. This particular science in sustainability focuses on job creation, education and health plus the prosperity of the dwellers of a particular environment (Goerner et al., 2009). From Maslow hierarchy of need, human basic needs i.e. physiological need, need for survival, safety, love, and self-esteem must first be satisfied before other needs are considered (Maslow, 1968, 1999). This stance connects human beings needs with the environment through economic development. In other words, the satisfaction of basic needs precedes environmental worries (Vallance, et al., 2011). They illustrated this by accentuating the limitation of sustainability policies due to social acceptance and that poverty is an obstruction to the adaptation of any sustainability issues.

The social pillar of SD broadens the extent to which social values, identities and relations can influence the future. Humans cannot survive without a safe environment nor in a non-resilient economy (Black, 2004). Also called societal cohesion, it forces society to labour for a common purpose. This is critical for the interconnectedness of generations (Moldan et. al., 2012) demanding for a harmony between the three mainstays of SD (Goerner et. al., 2009).

Increasing worry about environmental sustainability is taking the lead in most debates on security and policy obligations (Migone, 2007). Life is heavily dependent on the environment making it imperative for humans to live within its limitations (Moldan et al., 2012). The environmental pillar pursues the improvement of social welfare through the preservation of nature used for raw materials and ensuring that generated waste from these activities does not threaten the same lives it is preserving (Goerner, et. al., 2009).

Inferences from SD places a lot of emphasis on careful reflections that bring timely policy interventions that attain economic and social improvement that would not compromise the environment. These pillars are interrelated, interconnected and dynamic (Nessa et. al, 2007). This is why for SD to work in any given society, Nessa, et al. (2007), suggested the practice of adaptive governance that emphasizes that policy interventions, their frameworks and instruments regularly adopt new and evolving situations. It would involve flexibility and constant monitoring that must be accurate, measurable and futuristic to identify change as at when needed (Pupphachai & Zuidema, 2017; Coelho, et. al., 2012; Mascarenhas, Nunes & Ramos, 2015).

SD main goal can thus be summarised as preserving nature but at the same time preserving life for the future (Migone, 2007). This provides the prospect to incorporate security and safety in SD. As a political issue, security issues have to be tackled side-by-side live preservation (Allouche, 2011). Security and safety procedures should be a total package that includes impacts on the environment and its people (Coaffee, 2008). This why discussions that centres on sustainable development must take political resilience with security as the major factor integrated into economic, environmental and social issues.

2.4. National and Political Security

One of the first definitions of 'national security', belonging to the period of Cold War and given by an American political scientist Lasswell (1950, p.75) who stated, "The distinctive meaning of national security means freedom from foreign dictation". This definition demonstrates different enabling and broader connotations to the term 'national security'. Thereby, another security-related worldview that originates from liberal-institutional conceptualisation of international relations that sees the world more and more shaped by order and co-operation

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and less like conflict and anarchy. According to this new paradigm, the probability of interstate aggressions seemed minimal, attacking becoming an exception when compared to earlier times when aggression was considered a rule in international life. However, this makes the states to view any predatory attack as backward, useless, and most probably provocative. Consequently, Charles Maier (1990) proposed a new definition for national security and specified, "It is best described as a capacity to control those domestic and foreign conditions that the public opinion of a given community believes necessary to enjoy its own self-determination or autonomy, prosperity and well-being". Richard Ullman's (1983) definition of national security stems from the same period and it highlights the ability to maintain or expand the quality of life of the inhabitants of a state and the range of policy choices available to the government. Already these two definitions from the 1990ies demonstrate the importance of the population and their well-being as aims of national security, which have taken central roles during the last decades.

The political security aspect of national security depends on the effective political inclusion of disaffected groups and the human security of the citizenry. According to Wolfers (1962, pp.147-165), "Security, in an objective sense, measures the absence of threats to acquired values, in a subjective sense, the absence of fear that such values will be attacked." In the neighbourhood of Russian Federation, Estonia's national security has been an essential topic since 1991 when re-independence was gained through the Singing Revolution (Lauristin and Vihalemm, 1998; Rakfeldt, 2015). While for Estonians (Estonian-speakers) of the country, the newly gained independence was a part of self-actualization, however, for most of the Russian-speaking population, it meant losing the privileged status they had in the former Soviet Union. Consequently, their status turned to a minority in a small independent country that opposed the values and attitudes that were common in the ex-Soviet Union. In addition, the status of Russian language changed in 1989 when Estonian language law was adopted and Estonian was declared in Estonia as the only national language for public and private services communication. These changes were shocking for most Russian speakers, which provoked several protests and actions in Tallinn and Ida-Virumaa County.

The largest concentration of settlement of Russian-speakers was (and is) in bigger industrial cities and towns of Estonia (Tallinn, Narva, Kohtla-Järve, Jõhvi and Sillamäe). Even though the Russian-speakers organised themselves into several Russians-oriented parties in Estonia, these activities were not significant in the long term as these parties were poorly financed, they ended up not getting significant votes at the parliamentary level. Nevertheless, the Estonian Centre Party was able to attract votes from most of the Russian-speakers in later decades and meanwhile, Russian-speaker Estonians together with Estonian-speaking pensioners formed the majority of Centre Party supporters (Lauristin and Kallas, 2008). The representation of the Centre Party has provided the Russian-speakers of Tallinn and Ida-Virumaa County a strong feeling of participation in the Estonian society since in municipal elections it is possible to vote after 2-years registration in the municipality without being Estonian citizen.

After the start of the Ukrainian crisis in 2014, the Estonian Government put together a special "Ida-Virumaa Action Plan 2015-2020" which was prepared by the Ministry of Internal Affairs and later updated and monitored by the Ministry of Financial Affairs (Ida-Virumaa Tegevuskava, 2016). The action plan supports the development of Ida-Virumaa County as of a region of Estonia that is economically and strategically significant. It highlights Ida-Virumaa as a region of great entrepreneurial and labour market possibilities. Besides, the GDP regional growth has been one of the highest in Estonia and the growth of incomes has been among the highest during 2007-2017. Additionally, the cargo handling volume at Sillamäe port increased significantly since the opening in 2005 to 2013 and reached 8 million tonnes a year. Nevertheless, Ida-Virumaa still lags behind when compared to other counties by several socio-economic indicators. This region is the county with the fastest diminishing and ageing population. Between 2001 and 2011, the county lost 17% of its population and these losses have been especially dramatic in the cities. According to prognoses by Estonian Statistics Office, the population will decrease by more 27% by 2040 (ibid.). The share of children under 14 years and youth in the population is only

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14%, which is the lowest in Estonia. According to prognoses, this can even decrease by 2040 to 10% making its job market pressure index the least favourable in Estonia. During the next 10 years, more people will retire and leave the job market when compared to those who enter the market. The ratio will be 6 new employees instead of 10 persons who will leave for the pension. Furthermore, the county is the highest by the share of the population who live in relative poverty about 30% (2011). (ibid.)

3. Methodology

The research methodology is based on semi-structured interviews together with a small-scale survey of experts, a case study, and a further exploration of potential regional development options for North-Eastern Estonia to overcome possible economic difficulties and to strengthen the social coherence in the frame of the Estonian Smart Specialisation strategy. The case study focuses on the activities of the maritime fuel company Viru Keemia Grupp AS (VKG) located in Kohtla-Järve in Ida-Virumaa with the aim of studying how the company's business activities were affected by the sulphur emission regulations.

VKG was used as a single study unit since a case study is a type of research that investigates an individual, community or group to answer a specific question by seeking evidence that lies in the case setting (Gillham, B., 2000). During the years 2016 and 2017, data were collected in the frame of the EU project "EnviSuM" from the company's records, the yearly financial statement of the company, and from regional stakeholders. Face-to-face structured interviews were made in October 2016 with the company's director of sales and the product development manager. During this time, the authors had also several interactions with VKG employees from administration and production department. Additionally, on-site observation of the company's activities was made together with a tour of the production site for a first-hand experience.

Knowing that knowledge and understanding of how the environment impacts any business decision is key to the growth of any company (Fleisher and Bensoussan, 2003), VKG's SWOT analysis was carried out through a brainstorming session as a diagnostic technique. The interview data together with the information from the brainstorming session was then used to evaluate VKG's strategic position and to analyse its business profile vis-à-vis a highly volatile and competitive market to draw out different suitable strategic investment options for VKG since successful value propositions are said to be embedded in great business models (Osterwalder and Pigneur, 2009).

In addition, the research involved 10 independent regional development experts from public administration, business and science regarding different options for regional development strategies for Ida-Virumaa region. The experts provided also their assessments and comments to obtain a multifactorial evaluation of different development paths for the region. The empiric measures comprised a survey, which was filled by the above-mentioned experts and which was analysed together with the outcome of the semi-structured interviews by using qualitative and quantitative methods.

4. Results

4.1. Case Study: Viru Keemia Grupp

The subject case, Viru Keemia Grupp AS (VKG), is one of the largest Estonian companies and a producer of oil shale, which has a sulphur content that exceeds both the SECA and the global sulphur emissions limit. Up until 2015, VKG was able to produce oil shale as bunker fuel without restraints. Due to the recent MARPOL regulations, the company has the challenge of producing the stricter sulphur reduction of 0.5%. In order to meet

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the demand of the new regulations and to persist in a highly competitive market, going forward, VKG must make tough and strategic business decisions linked to high investments and serious financial risks in the maritime fuel market.

In 2015, VKG's contribution to the state budget of Estonia was up to €35 million and Company's total turnover was €167 million of which €87 million was related to business activities from oil shale alone. VKG initially started as a oil shale producer but have in over the years expanded and diversified its value chain to about 10 enterprises: oil, heat and power generation, heat distribution, electricity distribution, power system construction, oil shale mining, cinder blocks production, metal structures, pipelines and pressure equipment production, logistics, assemble and repair companies. As at 2015, VKG has employed over 2100 employees with a monthly average salary of 1 390 € which much higher than the average monthly salary in Ida-Virumaa County of 863€ (SYBE, 2016; Estonia: 1065€; VKG, 2015).

The oil shale (raw material) in its solid state is extracted from underground mine of VKG Ojamaa mining site. Over 3.4 million tonnes of commercial oil shale of both fine and coarse grade is produced annually from Ojamaa mining activities. The produced oil shale is useful as a quality-improving supplement for HFO or diesel supplement in industrial boilers and furnaces. After mining, oil shale is transported to Kohtla-Järve for processing in approximately 52 minutes with a 12.5 km conveyor (a piece of mechanical handling equipment that transports heavy and bulky materials from one end of location to another at production sites). VKG uses a thermal treatment technology where about 50-57% of oil shale energy is converted into liquid product (oil shale) energy while about 15-17% of oil shale energy is converted to gaseous by-product (waste gas) energy. A specific heat recovery process adds another 7-8% to the energy yield and the production of the solid by-products (mainly coke products) adds about 4 % energy yield.

The majority of VKG oil shale customers are some of the largest oil traders in the world. VKG Transport, a VKG subsidiary is responsible for its logistics and uses freight on board (FOB) - delivery for most of its distribution activities. The distribution process starts from the production site through the rail, which transports the oil shale directly to the port where tankers can pick for delivery to Rotterdam. Currently, there are marginal sales of VKG products to refineries; however, the majority of the liquid product mass is blended directly into product bunker fuel. Although VKG sells its fuel directly to oil traders and not to the end-users, considering the sulphur content of 0.8% as average in oil shale products, there might be a negligible possibility that the product is being used in SECA bunker fuel blend. Apart from its high sulphur content fuel by the SECA sulphur regulation, oil shale has a viscosity-density relationship preferable for specific purposes especially for improving HFO flow properties and pour point. This is one of the key selling points of oil shale but it does not separate VKG from the realities of the evolution in bunkering fuel and the regulations that surround it.

The oil shale industry is a subject of several controversial discussions in Estonia due to the high ecological impacts comprising of high emission of CO_2, mining and groundwater issues (Gavrilova, et al., 2005, 2010). Consequently, VKG as an oil production company is subjected to diverse environmental laws and regulations have to operate a centralised environmental department (ED) that provides services to all subsidiaries in VKG group. Because of its industrious promotion of environmental awareness activities, VKG has been consistently awarded "The Responsible Estonian Business" from 2010 to 2015.VKG intensive investments in the environmental causes had enabled a significant reduction in ecological footprint. About a €100 Million out of the €900 million investments VKG had made over the years on environmental related activities.

As a response to the SECA regulation, VKG came ahead with a refinery project that was in the pipeline before the SECA regulations. The feasibility study on own refinery building and bunker fuel market change research cost VKG about €5.5 million. Business wise, running a refinery would have meant a product innovation that will yield Euro V Diesel (a majority of the production), 0.1% sulphur marine fuel oil and stabilised naphtha outputs.

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However, the outcome of the research could not dispel the uncertainties that surrounded the 2015 sulphur regulations and the market reaction to the sulphur regulations. The feasibility studies also showed that the refinery for the raw material processing capacity of 133% VKG oil shale production will cost a staggering sum of €400 Million coupled with the 5% depreciation of €20 Million annually making the management of the company to putting the refinery project on hold. The risk is further magnified with VKG's constant struggle with uncompetitive and high fixed costs of its fuel production when compared to crude oil and the downward fluctuation of the fuel price.

A look at the financial statement of VKG between 2005 and 2015 shows the sizeable contribution of oil shale to the annual turnovers, although 2015 shows a decrease in oil shale contribution. Also for the first time in 10 years, VKG recorded a loss in 2015. One logical and obvious explanation for this occurrence is that oil price has fallen drastically, a bitter pill any operating oil company have had to swallow. A further look also shows the company's investment in 2015 was a lower percentage of the annual turnover (19.5%) when compared to previous years.

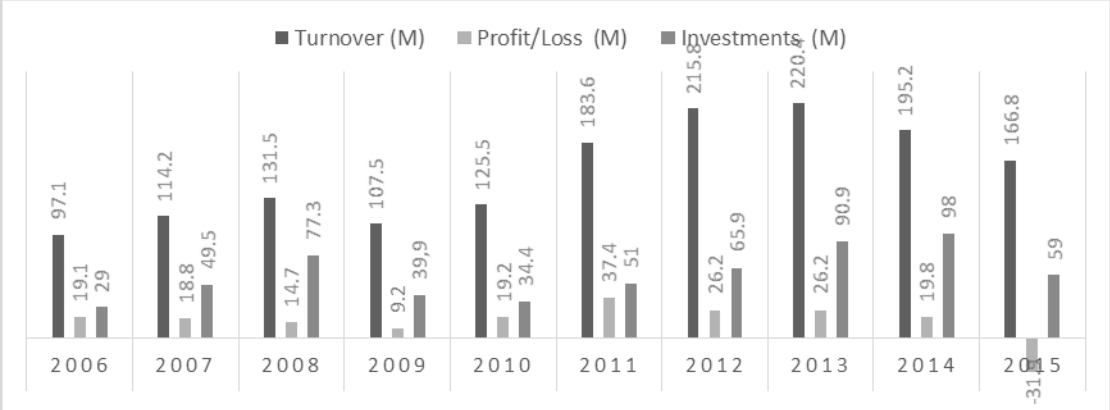

Fig. 1. VKG's financial statement (2005-2015)

Source: Authors' construction based on VKG AS 2015 Financial statements

Due to the new global sulphur emission cap from 2020, VKG has found itself in a position where it must make the assessment on the impact of sulphur regulations on the marketability of its oil products post 2020 and going forward on the most feasible alternative for its conformity with the regulations. Thus, VKG is faced with two major challenge; first, the fuel price collapse and its highly volatile market and second, the sulphur emission regulations compliance investments. Realistically, VKG could strategically choose from five investment portfolios. These are upward vertical integration, products upgrade, hydrodesulphurisation, and product discount and process innovation.

1) *Upward vertical integration*: Blending VKG oil shale with the 0.1% MGO or other low-sulphur content fuel-an upward vertical integration in its supply chain process. In this case, VKG will sell directly to its suppliers and will solely be in charge of how these products are supplied. With this action, VKG may likely be able to increase its share in the market by minimising the bottlenecks created by intermediaries and reduce its transaction costs, leading to an increase in its profits.

2) *Products Upgrade:* Building a new refinery, which could results in a change of marketable products portfolio for VKG such as V Diesel, 0.1% Sulphur marine fuel oil and stabilised naphtha. However, the costs involved would have been higher than the stated capital expenditure (CAPEX) of €400 million. For instance,

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there will be additional investments in operational cost (OPEX) that involves employing more staff, maintenance, insurance, administration. The cost of operation without depreciation is estimated to be between €30-50 Million/year, which it will also depend on the price of natural gas and on the amount of the raw material (oil shale), processed.

3) *Hydrodesulphurisation*: The treatment (partial hydrogenation) of product-oil for sulphur removal (desulphurisation) is a chemical reaction between molecular hydrogen (H_2) and another compound or element in this case - sulphur, with the help of a catalyst (Kabe et al., 2000). Heavier distillates are usually broken down through this process. While this process will solve the sulphur content challenge, hydro-desulphurization of oil shale might cost VKG between €100 – 150 million capital investments.

4) *Product Discount:* VKG can continue marketing of its existing 0.8% w/w sulphur content product but with a discount to traders if the future spread between less 0.5%w/w sulphur fuel oil and less 0.1%w/w sulphur fuel oil.

5) *Process innovation:* Process innovation, an implementation of a significantly improved production method (Utterback, 1994) will increase and improve VKG efficiency (energy efficiency, a mass yield of products and labour productivity) as a key factor for sustainability post-2020 global sulphur cap.

Olaniyi and Viirmäe (2016) empirically assessed the investment portfolio of VKG and found out that there are only two options with a positive return on investment, namely the hydrodesulphurisation and the product upgrade and both options are equipped with a relatively high risk related to the future oil price and the price spread between oil and other maritime fuels. By comparing both options, it turns out that hydrodesulphurisation has the highest return on investment when compared to product upgrade it enjoys a lower risk so that the hydrodesulphurisation investment looks like the most favourable option for VKG. Hydrodesulphurisation option is related to necessary investment costs of €100 – €150 million which are unfortunately is linked to a financing problem due to high risks and appearing losses in the financial statement from 2015. The hydrodesulphurisation option challenge is also linked to oil shale resource allocation that is smaller than VKG processing capacity so that VKG unable to meet up to 100% of its oil shale production capacity (Olaniyi & Viirmäe, 2016). This problem could be solved by the cooperation of the regional oil shale companies, which are competing currently.

4.2. Political Options for Eastern Estonia

In the last 26 years, Tallinn as the capital has successfully reorganised its structure and industry and a lot of population (incl. Russians-speakers and others) have gotten new jobs in the same field of industry or have had the possibilities to choose between other options (e.g. service, transport, logistics). At the same time, the situation of Russian speakers in North-Eastern Estonia has not changed very much although several changes in the economic structure of this Ida-Virumaa county have appeared. Russian-speakers of Ida-Virumaa form majority of the population of Narva, Kohtla-Järve, Kiviõli and Jõhvi. The Estonian government has originated several initiatives for Ida-Virumaa county, e.g. supporting entrepreneurship, teaching Estonian language (free courses and paid courses), the governments in 1990-s appointed to Ida-Virumaa special regional public officers. At the same time, because of the transformation and major changes in the Estonian and Russian economy, previous orders for Ida-Virumaa factories (e.g. Kreenholm Manufacture, Baltijets) to Russia and other parts of the CIS stopped. Because of this, the main available jobs for Ida-Viru population remained in the oil shale industry that produced in addition to raw oil shale for the industry, electricity nation-wide and heat for the consumption of the county. Because of privatization of Ida-Virumaa plants (e.g. Kreenholm), the rise of global competitiveness, automation, lowered oil price, global economic and financial crisis, crises in Russian economy the diminishing demand for workers in the last century quarter has caused tremendous staff lay-off in Ida-Virumaa (Altosaar, 2014).

This led the county to have one of the highest out-migration indicators in Estonia. Several sociological surveys have shown that a lot of Russian-speaking people feel quite deprived and abandoned in Ida-Virumaa, especially those who have lost their jobs and have given up to look for new opportunities. Their mobility is quite low as their

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readiness to look for jobs outside their county. This can be because of their insufficient use of Estonian language that is currently a requirement in almost any type of employment. Because of their linguistic limitation and their habits from Soviet time or childhood, they are used to Russian TV channels, that are air biased and negative news and programs on the events in Estonia, European Union and in the West in general. This propaganda particularly fuels their discontentment in their desperate situation. In 2009, the government set up an aim to create 4,400 new jobs in a 10-year plan based on oil shale industry-related fields. For now, this plan has only fulfilled about 10 percent of the proposed number (Gamzejev, 2018).

At the beginning of 2018 the low oil price put an economic pressure on the oil shale sector and in addition to that, the SECA regulations push the sector into a strategic trap because starting from 2020 big parts of the products portfolio, namely the production of maritime bunker oil, will have to change making demand for expensive restructuring money. Related loans are complicated to access because already the 2015 annual report showed a loss and the low sulphur fuel regulations bedevil the access to fresh capital for the company. Additional discussions concerning ecological and sustainability issues are making the situation even more complicated so that it seems that without political support and guarantees, the situation cannot be positively changed. By taking under the account, the case study of Viru Keemia Grupp the Estonian political authorities possess a number of options on how to deal with the oil shale industry in North-Eastern Estonia. All options are linked to specific chances and risks, which will be discussed in the list of the following options.

One of the most recent plans is the establishment of Ida-Virumaa County Industrial Areas Development Foundation (IVIA) as a development organisation created by the public sector, founded by the Estonian Ministry of Economic Affairs and Communications, the City of Narva, the City of Kohtla-Järve, the City of Kiviõli and Jõhvi municipality. It is set up to develop five industrial and business parks in Ida-Virumaa County, being the owner of the property with supporting infrastructure. The goal of this publicly founded organisation is to attract new industrial and logistics companies thereby creating new workplaces. (IVIA, 2018) By 2018, several industry projects started and investments started coming in for the four planned industry parks in Jõhvi, Narva, Kohtla-Järve and Kiviõli. According to Teet Kuusmik, a board member of IVIA, in his interview to Estonian Radio on 16.01.2018 (ERR, 2018a,b), the expectation is that during 2018-2020 they would have created around 1,500 new jobs in North-Eastern Estonia.

At the end of February 2018, VKG announced that they managed in 2017 to mine oil shale more than ever - 4.1 million tonnes and 535,000 tonnes of oil shale were produced from the ore. Days later Estonian national energy supplier Eesti Energia published their achievements: 16 million tonnes of oil shale was mined that was used for 9 TWh electricity and 395,000 tonnes oil shale. Despite the competition between these two companies, Estonia is one of the few states in EU that can cover its energy demand using domestic resources, also electricity and oil shale is used for earning income from the export. If the exploitation of oil shale continues in the same way and in the same amount, it can last for 50-100 more years (Gamzejev, 2018).

Based on the expert interviews from 2017 different regional development strategies elaborated that resulted in five future strategies in total. In March-April 2018 10 regional and over-regional experts were invited to participate in a survey which allowed the assessment of these strategies concerning economic, ecologic and social sustainability as well as security. The analysis of the expert interviews led to five regional development strategies for Ida-Virumaa region:

The 1st option concerns the continuation of the current situation without any specific activities which are described as option 1 under the title of "no action". This means that Ida-Virumaa's as an economic area together with its industry should be freed from transactions and intervention by Estonian government like regulations and subsidies. This strategy, although questionable, leads to total self-regulation, called among economists *laissez-faire* (Rogers, 2000).

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The 2nd option is subsumed under the title "reduce taxes", i.e. to alleviate the tax rates and the public charges for oil shale industry which mainly let benefit Ida-Virumaa region but which is linked to a couple of complex political questions. First, it has to be mentioned that the Estonian oil shale industry consists of public as well as of private companies so that alleviation of public fees can be considered as a subvention of specific business sectors, which will cause problems with national business groups as well as with EU regulations.
The 3rd option is not related to direct financial transactions of the public sector. The public level, in this case, guarantees the needed investment of the oil shale industry and represents an often used instrument of industry policy in other EU countries like already appeared in shipbuilding or mining sector.

The 4th option is to take money from other sources like ERDF budgets to invest in specifically promising business sectors for Ida-Virumaa County. This represents an active industrial policy and is not new for EU countries. After the financial and economic crisis in 2009, many national and regional authorities rediscovered industrialisation as a major concern for the sustainable well-being and invested big budgets into industrial infrastructure (Prause, 2015).

The 5th option consists of the qualification of the regional workforce in order to make the region more interesting for foreign direct investments and to attract so new companies and even business sectors. Historically, Eastern Estonia and especially the Russian-speaking population has a high reputation as an industrial workforce with a focus on special branches comprising the textile and metal industry as well as logistics. The existing skill base is suitable for use and development to prepare the human capital for the needs of smart production and logistics. The necessary financial earnings can be achieved using the ESF resources as well as public revenues from oil shale industry.

5. Findings and Discussion

5.1 Discussion of the Strategies

The experts who analysed all mentioned options added a set of valuable comments to the five different regional development strategies. The most often mentioned comments related to the first strategy "**no action**" were pointing out about the future when "…using of oil shale decreases in any case, i.e. the unfiltered dust-burn pots will be closed down by 2024 and filtering of SOx and NOx by 2030-2035. This means that from today's power production of 1800MWe power there will be kept by 2015 730MWe that consume oil shale instead of current 12 million tonnes merely 5-6 million tonnes a year and the number of jobs will decrease by ca. 3,000 workers. To some degree, Eesti Energia will compensate for this loss of jobs by building an oil production factory Enefit 280 by 2030." The experts also estimate that the age of oil does not end at least during next 50 years, but economically it is very important to have oil shales post-production, in order to refine it similarly to other raw oils and for this purpose, the state should contribute much more into R&D. This view of the expert stresses more on the industry's perspective using research & development initiative from the government as a solution for an impending crisis that can be caused by unemployment of current workforce of the area.

Current **taxation** according to the experts is the biggest burden for the companies. The reason for this is the abnormally high and unreal as pollution tax, as the Estonian pollution taxes are considered the most complex and the highest in the world and nowhere else would anyone find enterprises that pay pollution tax for using cooling water in condensation regime (Eesti Energia pays ca 8 million Euros a year). Comparable pollution taxes do not exist in Europe, except Poland which collects money for storing mining waste, which causes problems for producers, because these costs represent fixed costs not depending on market prices or profits. Consequently, the pollution taxes are unfair and lowering the growth of the Estonian oil shale enterprises. This result seems to be an

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Estonia specific because it contradicts with Gavrilova et al (2010) who claimed that most of the resource and environmental taxes for the oil shale industry are lower, in some cases very remarkably lower than for the other industries. Experts' opinions further highlighted that the most regrettable circumstance of North-Eastern Estonia in the context of taxation is not related to the collection pollution taxes but to the fact that only about 5% of taxes from oil shale industry actually come back to Ida-Virumaa. The rest is quite evenly distributed through the state budget and the Environmental Investment Centre (KIK) all over Estonia. One expert stressed that if 30% of the collected taxes (approximately 12 million Euros) could be redirected back to Ida-Virumaa as **guarantee** or investments for regional development, then, North-Eastern Estonian might be a prospering part of the European Union.

The experts agree that the idea of creating growth and new jobs with state **investments** is generous, but this approach has some limitations since the re-organisation process does not take place as fast as one might expect and is only partly controllable by the state. The example of Ida-Viru Industrial Areas, originated in 2014, shows that although the first plot for a new company was established in 2015, and now in 2018, despite the fact that 135 plots are ready and completed, only six plots are taken by companies providing 400 jobs and on two plots there are ongoing construction works. Expert concludes that this kind of scenario is largely dependent on economic conditions and on a large number of stakeholders like banks and investors. Complications in developing new businesses had been described also by data about lower overall entrepreneurial activity and density in the area (SYBE, 2016). New attempts to enliven entrepreneurship and business activities are may-be slow, but some progress is clearly visible.

Demand for high **Qualification** can be considered as well, but in practice, there should be also a real demand for the workforce rather than some lofty qualifiacation. To some degree, it may work (in respect of mobile workforce), but the reality of Ida-Viru has been directed to the industry. Thereby, increasing the employment in the industry has been grounded. This is also one of the motivations of the state and a reason why Geological Survey of Estonia was established to investigate if other mineral resources of Estonia (phosphorite and argillite in Ida-Virumaa, iron ore in Jõhvi and elsewhere) can be possibly used. By that, if possible, create new highly paid jobs for those laid-off from oil shale sector. A general remark of the experts was that is complicated to keep a skilled workforce in a region without high technology and innovative companies since competitive salaries are necessary to prevent brain drain to highly developed areas. In this sense, Ida-Virumaa would compete with Tallinn, Estonian capital where the salaries are higher especially. To a great extent the relatively high wages in the energy sector and in mining in North-Eastern Estonia have avoided a stronger out-migration of the workforce.

4.2. Discussion of Survey Result

The ten experts answered besides the interviews also a survey on future regional development strategies for Ida-Virumaa and assessed the five different regional development strategies with respect to economic, ecologic and social sustainability as well as to security aspects. The statistical analysis of the expert survey revealed the five regional development strategies assessed by the experts and the analysis of variance showed significant differences between the answers of experts with a p-value of less than 1‰. The experts fall into three different groups that can be characterized by group 1 (3 experts) which had an overall slightly negative view, group 2 (3 experts) which had a neutral overall view and group 3 (4 experts) which had a positive overall view.

The two regional development options "Investments" and "Qualification" gained the highest scores nearly on the same level, followed by the option "Guarantees" which scored also positive but only on a level of 25% of the two leading strategies. Negative assessments appeared only for the regional development options "No action" and "Taxation". When it comes to the impact of the different regional development strategies on the three sustainability dimensions and security it turned out that the highest scoring was measured for economic sustainability in case of the investment strategy followed by social sustainability for the qualification strategy.

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The highest score for security appeared for the qualification strategy and surprisingly low was the score of the investment strategy on security. By taking a closer look at the two favourable strategies it turns out that the experts saw the investment option as the best possibility to generate economic and ecologic sustainability whereas the qualification options seem to be the favourable strategy to safeguard social sustainability and security.

Correlation analysis revealed relatively high similarities between the first three strategies 1-3 on one side and the last two strategies 4-5 on the other side and a relatively low correlation between the two blocks. In addition to that, there was a high correlation between social sustainability and security and a surprisingly low correlation between economy and security with the lowest correlation value of ca. 60%. These results raise the question if security for Ida-Virumaa is rather depending on the economic situation in the region like stated by the study of the International Centre for Defence and Security or if the social conditions are rather important for the loyalty of the Russian speaking Estonians (Kivirähk, 2014).

By considering the overall means of the four sustainability dimensions, economy has the highest value whereas they gave the lowest but positive value to ecology. This result allows two different observations, firstly the experts saw the highest potential for Ida-Virumaa County in the economic field and secondly that the ecologic perspective is still positive but represents the most controversial issue for the county. The medium means of social and security issues reveal a level of lower prosperity, which will, in any case, be improved after a sustainable economic development, takes place.

The final remarks should be expresses concerning risks for oil shale industry and depending effects on Ida-Virumaa. Kallemets (2018) discussed the risks related to EU Emissions Trading System, which are currently low with no evidence that the European Union Allowances might rise in the near future. Yet, there is a high uncertainty about CO2 prices in the emission trading systems causing minimal income for Estonia for not consuming the planned production volumes in oil shale industry. An additional risk represents the already mentioned requirements under MARPOL annex IV forcing that all marine bunker fuels to contain no more than 0.5% of sulphur by the year 2020 by keeping in mind that the average sulphur content of Estonian oil shale is 0.8%. Finally, in a low price scenario of 200€/t for HFO the Estonian oil shale industry is likely to fade out, whereas at a price range around 320€/t for HFO would be sustainable and even 450€/t for HFO would lead to substantial capacity increasing investments according to EY 2016 study (EY, 2016).

5. Conclusions

The Estonian oil shale industry represents an important national economic sector with high contributions to export, innovation and workplaces. Through falling oil prices and the enforcement of the SECA regulations in 2015, the Estonian oil shale sector has come heavily under pressure. The case study of Viru Keemia Grupp (VKG) shows losses in 2015 and a deeper analysis even reveals a strategic trap, which is linked to SECA regulations. In the current situation, the company cannot by themselves handle this crisis; hence, the question about political support appears.

For North-Eastern Estonia, especially for Ida-Virumaa County, oil shale industry plays an important role with a regional impact of about 50% on the workplaces and high contributions to regional income. Ida-Virumaa County is dominated by Russian-Estonians who are only weakly integrated into the Estonian society and who suffer from the highest regional unemployment rate in Estonia so that the economic situation of oil shale industry directly impacts the social cohesion. Despite the ongoing discussions on the ecological impact of oil shale and the missing integration of the oil shale industry into Estonian smart specialisation strategy, the research shows that currently, the active support of Estonian oil shale industry brings more advantages than disadvantages.

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Concerning the long-term development, the research explored and discussed different regional development strategies for North-Eastern Estonian which all have their strengths and weaknesses and which were assessed by an expert group. Only the investment strategy and qualification strategy have the potential to lead to substantial improvements in sustainability, social cohesion and security in the region. Nevertheless, the dominating oil shale industry is fading out with the decline of fossil energy so that new regional development strategies are needed for Ida-Virumaa County keep prosperity and to safeguard social coherence in North-Eastern Estonia.

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