University of Salford
A Greater Manchester University
University of Essex
ESSEX BUSINESS SCHOOL
International Centre for Entrepreneurship Research
The General Jonas Žemaitis Military Academy of Lithuania
Ministry of National Defence Republic of Lithuania
Vilnius Gediminas Technical University
RISEBA
Estonian Business School
NATO Energy Security Centre of Excellence
ENTREPRENEURSHIP AND SUSTAINABILITY CENTER
AVADA

JOURNAL OF SECURITY AND SUSTAINABILITY ISSUES
ISSN 2029-7017 print/ISSN 2029-7025 online
2015 March Volume 4 Number 3
http://dx.doi.org/10.9770/jssi.2015.4.3(6)

SUSTAINABLE DEVELOPMENT THROUGH TECHNOLOGY TRANSFER NETWORKS: CASE OF LITHUANIA

Rytis Ignatavičius[1], Manuela Tvaronavičienė[2], Leonardo Piccinetti[3]

[1,2] Vilnius Gediminas Technical University, Saulėtekio 11 LT-10223 Vilnius, Lithuania
[3]Rete Europea dell'Innovazione S.r. L, Rue de la Science, 14 B, 1000 Brussels, Belgium
[3]Europe for Business, 26 Foubert Place, WP1 7PQ London, United Kingdom

E-mails: [1]ignatavicius.rytis@gmail.com; [2]Manuela.Tvaronaviciene@vgtu.lt; [3]l.piccinetti@gmail.com.

Received 15 November 2014; accepted 20 January 2015

Abstract. Considering lack of benchmarking and observation data, the article analyses issues of technology transfer in Lithuania. Comparison of Lithuanian innovation performance with EU country members is given as well as foreign direct investments in last period. While analysing main technology transfer networks, article explains what problems Lithuanian clusters meet in each model. The main conclusion is that Lithuanian clusters lack experience and investments, also Lithuanian enterprises are mainly small and may not be interested to invest in the development and adoption of technology.

Keywords: sustainable development, technology transfer, cluster, foreign direct investments

Reference to this paper should be made as follows: Ignatavičius, R.; Tvaronavičienė, M.; Piccinetti, L. 2015. Sustainable development through technology transfer networks: case of Lithuania, *Journal of Security and Sustainability Issues* 4(3): 261–267.
DOI: http://dx.doi.org/10.9770/jssi.2015.4.3(6)

JEL Classifications: O1

1. Introduction

Over the past years social scientists and policy makers have been playing more and more attention to regions' growth and sustainable development. Competitiveness and innovativeness are considered to be the key aspects to assuring economic success (NGP Cluster Excellence Conference – Inge Maerkedahl 2011; Balkienė 2013; Laužikas, Mokšeckienė 2013; Mačiulis, Tvaronavičienė 2013; Vosylius *et a.* 2013; Ala-Juusela *et al.* 2014; Guruz, Scherer 2014; Cuneo *et al.* 2014; Barberis *et al.* 2014; Lankauskienė 2014; Figurska 2014; Tvaronavičienė 2014; Vasiliūnaitė 2014; Išoraitė 2014; Morkvėnas 2006).

In this regard it is important to share information and learn from each other. Clusters enables companies to do exactly that. Clusters are complex and dynamic structures that are subject to continuous change. Strong clusters can promote economic growth through leveraging the innovation and business potential of a region (Lämmer-Gamp 2012). The faster the knowledge is absorbed the greater the dependence on the sources of knowledge becomes (Nonaka, Reinmoller 1998). In a dynamic and rapidly changing contemporary globalizing economy it is, thus, necessary to pay attention to knowledge creation as a process that is of equal importance to the processes of learning and competence building (Asheim and Coenen 2005).

In our economy knowledge is the most strategic resource and learning is the most fundamental activity for competitiveness (Lundvall 1992). Europe's past was shaped by science: the Greco-Roman Antiquity, the Renaissance and the Enlightenment all emerged from advanced European scholarship, arts, research and ingenuity. Yet we cannot afford to simply gaze upon this legacy with nostalgia and pride. We must look forward, and recognise that not only is science a part of our future, it must be central (A report of the President's Science and Technology Advisory Council (STAC) 2014).

Technology transfer is one of main methods to share information and it is aimed to strengthen cluster management excellence as well as to provide more professional business services to European SMEs through clusters and contributes to development of more world-class clusters in the EU. Moreover technology transfer can be used as a tool for benchmarking clusters which helps identifying cluster strengths and weaknesses, know where it stands in international comparison. In the last decades, Science and Technology politicians have given wide concern to technology transfer themes. In the European Union a bundle of measures at regional, national and communitarian level has supported the creation of many satellite agencies and organisations variously dealing with technology transfer. However, their model and structure is not always clear: missions are sometimes blurred, overlaps and missing competencies are frequent, and some degree of competition and mismatch of objectives is perceivable.

2. Study Area

Like other former Soviet republics, Lithuania has been virtually closed to foreign investment until 1990, when it regained its independence and began the process of transition to a market economy. The first stage of the privatization process, which began in 1991, offered limited opportunities for foreign investors. It was not until 1997 that foreign direct investments (FDI) inflows into Lithuania increased significantly, as a result of the second stage of the privatization program. FDI inflows peaked in 1998, when 60 percent of the shares of Lietuvos Telekomas (Lithuanian Telecom), the fixed-line monopoly operator, were sold to Amber Teleholdings, a consortium of Swedish Telia and Finish Sonera (EBRD 2001) (Hoekman and Smarzynska Javorcik 2006) (Figure 1) .

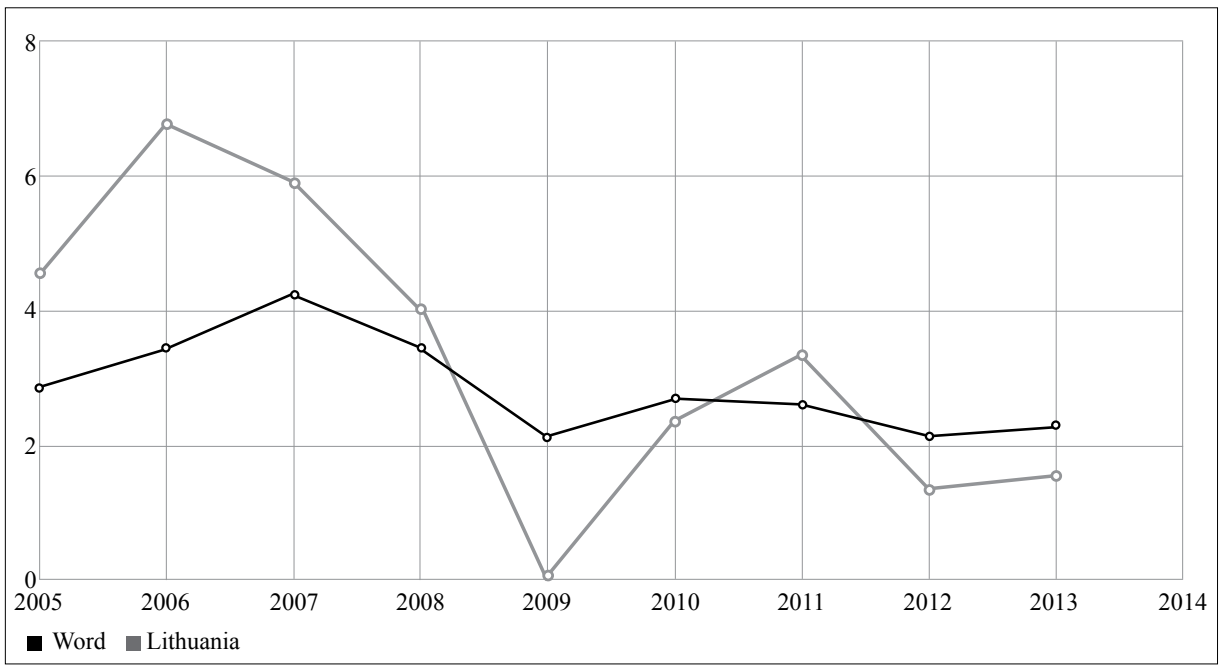

Fig.1. Foreign direct investments, net inflows to Lithuania

Source: The World Bank

Due to its late start, Lithuania has attracted less FDI than other Central and Eastern Europe countries, but after economic crisis in 2006–2008 is rising fast. Unfortunately FDI and technological innovations within closely cooperating business, science and governmental institutions not guarantee their successful integration into multiform systems (business, society) or its continual use. Lithuania has a lot of problems with the transfer and diffusion of new technologies. It is proved by the statistics of European innovation (Sajeva *et al.* 2005). The study of innovation and technology transfer models is rapidly becoming a popular line of study in the research of technological systems. Academicians, business managers, IT managers and other commercial organizations have benefited significantly from this line because the result is value-added. Lithuanian Universities are not normally known for their entrepreneurial attitude and flair. They are recognized, however, as major knowledge and research centers. It might be argued that for many start-ups it is becoming vital to come into a university as soon as possible (Jaržemskis *et al. 2005*). The ever changing perception of the role of technology in our society as well as in Lithuania provides educators with a myriad of challenges and problems for the curriculum. Lithuania's future begins from the knowledge and that determines the level of Lithuanian technological society.

3. Main objectives

It is vital for companies to separate what to learn and where to compete. In this situation it is necessary to have working benchmarking system that would serve companies as a tool to know where they have to do better, what they can learn from other, what are their strengths and their weaknesses (Büscher 2011).

Benchmarking, as a tool, would serve for three main goals:
- To benchmark cluster performances across the regions;
- To identify international, national and regional clusters;
- To identify successful cluster policies and to enable systematic peer reviews of cluster specific framework conditions (Andersen *et al.* 2006).

Identifying these aspects rises cluster excellence both to the benefit of firms and public authorities that are supporting clusters (Meier zu Köcker 2011). Importance of cluster benchmarking. It helps to move from financing cluster organizations to using cluster organizations for the implementation of cluster excellence policies, for example to commercialize European products and services worldwide and find partners outside the member states. It is, of course, important to underline "the tremendous importance of incremental innovation, learning by doing, by using and by interacting in the process of technical change and diffusion of innovations" (Freeman 1993).

The main specific objectives of this project can, therefore, be presented as follows:
- Verify an assumption, that cluster excellence impact could be measured by activities excellence achieved after joined cluster activities.
- Identify technology transfers impact to sustainable cluster development.

4. The problems of innovation and technology transfer

To begin with it has been noted by experts, that though the development of technology proceeds Lithuania as well has achievements in such fields as laser or biotechnology, however, these cases are rare. Moreover although Lithuania has enough resources for innovations, the interaction between universities and businesses is a casual and uncontrolled process. It should be noted that Lithuania's economy is based on small and medium businesses. Small and medium businesses do not have such favorable possibilities to use knowledge as large international companies do. Finally the changes in business environment particularly influence a small business. Government should create better opportunities for interaction between academic institutions and businesses. (United Nations 2003). As a result, based on this year's Summary Innovation Index, the Member States fall into the following four performance groups:
- The first group of Innovation leaders includes Member States, in which the innovation performance is well

above that of the EU, i.e. more than 20% above the EU average. These are Denmark, Finland, Germany and Sweden, which remains in the top position of these countries if to compare with last year's edition of the Innovation Union Scoreboard.

• The second group of Innovation followers includes Member States with a performance close to that of the EU average i.e. less than 20% above, or more than 90% of the EU average. Austria, Belgium, Cyprus, Estonia, France, Ireland, Luxembourg, Netherlands, Slovenia and the UK are the Innovation followers.

• The third group of Moderate innovators includes Member States where the innovation performance is below that of the EU average at relative performance rates between 50% and 90% of the EU average. Croatia, Czech Republic, Greece, Hungary, Italy, **Lithuania**, Malta, Poland, Portugal, Slovakia and Spain belong to the group of Moderate innovators.

• The fourth group of Modest innovators includes Member States that show an innovation performance level well below that of the EU average, i.e. less than 50% of the EU average. This group includes Bulgaria, Latvia, and Romania (Figure 2).

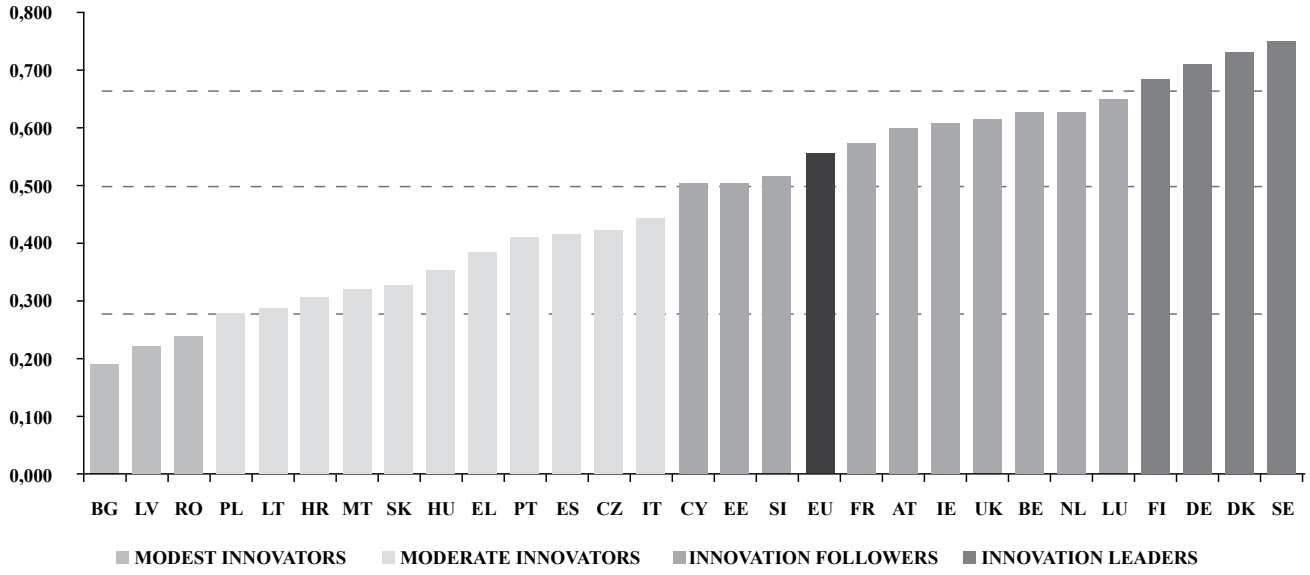

Fig.2. EU Member States innovation performance

Source: Innovation union scoreboard (2014)

The performance of EU national innovation systems is measured by the Summary Innovation Index, which is a composite indicator obtained by an appropriate aggregation of the 25 indicators. The components of the Summary Innovation Index are the key to solving technology transfer problems in Lithuania. The most important subjects which can determine the SII are University and Enterprises. However, it works when the government creates an environment for researcher (science) and businesses to come together.

5. Main innovation and technology transfer models

The scientific literature notes three main models of technology transfer and adoption but full existence of them in Lithuania is questionable. First model, also known as **Direct model** (University – Industry). As mentioned before, Lithuanian enterprises are mainly small and are not concerned with investment in the development and adoption of technology. In other words, model of technology transfer (University – Industry) in Lithuania does not exist because of low performance in industrial arias. Second model, known as **Intermediaries model**: (University - Science Park – Industry). The role of Science Park is undoubtedly positive. The main problem with these institutions is that the enterprises established are not entrepreneurial. Technology Parks are supposed to develop business and science interconnection, the enterprises specialization in science research and development sphere are engaged there. Technology transfer and innovation support services in Lithuania (*Innovation's centers, science and technology parks.):*

1. Lithuanian Innovation Centre, with 5 representatives across Lithuania;
2. 9 Science and Technology Parks:
   1. North Town Technology Park
   2. Science and Technology Park
   3. Visoriai IT Park
   4. Kaunas High and Information Technology Park
   5. Klaipeda Science and Technology Park
   6. Šiauliai University ST Park
   7. Sunrise Valley Initiative
   8. Technopolis Initiative
   9. Kaunas Regional Innovation Centre

The main problem with science parks is that there is no one benchmarking system adopted, which could show us how well or poorly they perform. Due to this industry is not willing to invest. Last model, known as **Intermediaries with Business Approach** (Establishment of new firms) University – Incubator/Open Lab – Science Park – Industry. The basic aim of a business incubator is stimulation of founding new companies and creation of a consultancy support environment with maximum opportunities of development of new companies (Medium and Small business developmental agency of Lithuania). However Lithuanian incubators, science parks, and open laboratories are only in the developmental stage (Braukmann and Pedras 1990; European Commission 2009; Kotilainen 2002; White 2005; Medium and Small business developmental agency of Lithuania 2001).

Conclusions

Sustainable development of regions is affected by industries and companies' innovativeness, which is partially determined by technology transfer mode. The problems of technology transfer are difficult and as varied as the organizations involved in the process. The problem is reflected by the European Union statistics in the technology and innovation sectors, where Lithuania in all categories does not reach the average of the European Union. Today a manager cannot solve engineer's problems, likewise an engineer's cannot solve manager's problems. This is the answer why incubators are needed and why we need technology planners and managers of broad specialization. There is no overall managerial system of innovation activity, the mechanism of promotion of innovation development is not effective enough. Lithuania has created a lot of various learning programs devoted to technology, but they often lack effectiveness and brain drain problem is becoming really serious.

References

A report of the President's Science and Technology Advisory Council (STAC). The future of Europe is science. 2014. Luxembourg. Available on the Internet: <https://www.google.lt/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCAQFjAA&url=http%3A%2F%2Fec.europa.eu%2Finformation_society%2Fnewsroom%2Fcf%2Fhorizon2020%2Fdocument.cfm%3Fdoc_id%3D7043&ei=pTrzVNXGKsjTU-2yg7AK&usg=AFQjCNHh-DU9sieiMj_-cv6dhbSCTb4drw&sig2=dawn2XQB664w8l9nmx4XsQ&bvm=bv.87269000,d.d24>

Ala-Juusela, M.; Short, M.; Shvadron, U. 2014. Tools to support sustainable entrepreneurship in energy positive neighbourhoods, *Entrepreneurship and Sustainability Issues* 2(2): 49–59. DOI: http://dx.doi.org/10.9770/jesi.2014.2.2(1)

Andersen, T.; Bjerre, M.; Wise Hansson, E. 2006. The cluster benchmarking project. Available on the Internet: <http://www.nordicinnovation.org/Global/_Publications/Reports/2007/The%20cluster%20benchmarking%20project%20-%20Benchmarking%20clusters%20in%20the%20knowledge%20based%20economy.pdf>

Asheim, B.T.; Coenen, L. 2005. Knowledge bases and regional innovation systems: Comparing Nordic clusters*, Research Policy* 34(8): 1173–1190. DOI: doi:10.1016/j.respol.2005.03.013

Balkienė, K. 2013. Sustainable innovativeness: issues and public policy, *Journal of Security and Sustainability Issues* 3(2): 53–76. DOI: http://dx.doi.org/10.9770/jssi.2013.3.2(5)

Barberis, S.; Di Fresco, L.; Santamaria, V.A.; Traverso, A. 2014. Sustainable entrepreneurship via energy saving: energy harvester exploiting seebeck effect in traditional domestic boiler, *Entrepreneurship and Sustainability Issues* 2(2): 86–97. DOI: http://dx.doi.org/10.9770/jesi.2014.2.2(4)

Braukmann, J.; Pedras, M. 1990. Preparing Students for Living in a Technological Society: A Problem Solving Approach to Teaching, *Journal of Technology Education* (1)2. Available on the Internet: <http://scholar.lib.vt.edu/ejournals/JTE/v1n2/pdf/braukmann.pdf>

Büscher, R. 2011. NGP Cluster Excellence Conference**,** Copenhagen. Available on the Internet: <http://nordicinnovation.org/news/ngp-cluster-excellence-culminates-in-copenhagen/>

Cuneo, A.; Ferrari, M.L.; Traverso, A.; Massardo, A.F. 2014. Sustainable district development: a case of thermoeconomic optimization of an energy hub, *Entrepreneurship and Sustainability Issues* 2(2): 74–85. DOI: http://dx.doi.org/10.9770/jesi.2014.2.2(3)

EBRD (European Bank for Reconstruction and Development) 2001. Annual report. Available on the Internet: <http://www.ebrd.com/downloads/research/annual/ar01.pdf>

Figurska, I. 2014.Sustainable entrepreneurship: localization, acquiring and use of knowledge sources in competitive organization, *Entrepreneurship and Sustainability Issues* 1(4): 210–222. DOI: http://dx.doi.org/10.9770/jesi.2014.1.4(3)

Freeman, C**.** 1993. The political economy of the long wave. Paper Presented at EAPE 1993 Conference on the Economy of the Future: Ecology, Technology, Institutions, Barcelona.

Hoekman, B.M.; Smarzynska Javorcik, B. 2006. *Global Integration and Technology Transfer, a copublication of Plagrave Macmillan and the World Bank.* Available from: < http://go.worldbank.org/6O8SPT29Z0>

Guruz, R.; Scherer, R. 2014.Sustainable energy entrepreneurship through architectural design: a key point controlled method, *Entrepreneurship and Sustainability Issues* 2(2): 60–73. DOI: http://dx.doi.org/10.9770/jesi.2014.2.2(2)

Innovate for a competitive Europe. A new Action Plan for Innovation, European Commission. 2009. Available on the Internet: <http://ec.europa.eu/regional_policy/archive/policy/future/pdf/5_seravalli_final_formatted.pdf>

Innovation union scoreboard 2014. Available on the Internet: <http://ec.europa.eu/enterprise/policies/innovation/files/ius/ius-2014_en.pdf>

Išoraitė, M. 2014. ICT and entrepreneurship: social network marketing, *Entrepreneurship and Sustainability Issues* 2(1): 19–29. DOI: http://dx.doi.org/10.9770/jesi.2014.2.1(3)

Jaržemskis, A.; Morkvėnas, R.; Jaržemskis, V.; Samoška, M. 2005. *Start-ups and universities should associate. Articles on Innovation.* Available on the Internet: <http://www.tsi.lv/sites/default/files/editor/science/Publikacii/ReStat_08/19.pdf>

Kotilainen, H. 2002.Technology transfer and science & technology parks. Finnish Experience. Innovation's centers, science and technology parks.

Lämmer-Gamp, T. 2012. Benchmarking as a Tool for Cluster Analysis, Berlin. Available on the Internet: <http://www.regx.dk/fileadmin/user_upload/Perfect_Cluster_Program_final_120411.pdf>

Lankauskienė, T. 2014. Accounting productivity in the sectors of economy: methodological aspects, *Entrepreneurship and Sustainability Issues* 2(2): 98–106. DOI: http://dx.doi.org/10.9770/jesi.2014.2.2(5)

Laužikas, M.; Mokšeckienė, R. 2013. The role of creativity in sustainable business, *Entrepreneurship and Sustainability Issues* 1(1): 10–22. DOI: http://dx.doi.org/10.9770/jesi.2013.1(2)

Lundvall, B. A. (Ed.). 1992. *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. Pinter, London.

Mačiulis, A.; Tvaronavičienė, M. 2013. Secure and sustainable development: Lithuania's new role in taking the Presidency of the EU, *Journal of Security and Sustainability Issues* 3(2): 5–13. DOI: http://dx.doi.org/10.9770/jssi.2013.3.2(1)

Maerkedahl, I. N.G.P. 2011. Cluster Excellence Conference, Copenhagen. Available on the Internet: <http://nordicinnovation.org/news/ngp-cluster-excellence-culminates-in-copenhagen/>

Medium and Small business developmental agency of Lithuania. 2001. Business incubators. Available on the Internet: <http://ktc.fastsite.lt/files/361/Management_of_Business_Incubators.pdf>

Meier zu Köcker, G. 2011. NGP Cluster Excellence Conference, Copenhagen**.** Available on the Internet: <http://nordicinnovation.org/news/ngp-cluster-excellence-culminates-in-copenhagen/>

Morkvėnas, R. 2006. Problems of Innovation and Technology Transfer in Lithuania*, Electronics and electrical engineering* 4(68): 77–82. Available on the Internet: <http://www.ee.ktu.lt/journal/2006/4/1392-1215-2006-04-06-77.pdf>

Nonaka, I.; Reinmoller, P. 1998. The legacy of learning: toward endogenous knowledge creation for Asian economic development, *WZB Jahrbuch 1998*: 401–433.

Sajeva, M.; Gatelli, D.; Tarantola, S. 2005. European Trend Chart on Innovation. Methodology Report on European Innovation Scoreboard 2005. Research Centre and Hugo Hollanders. Available on the Internet: <http://www.astrid-online.it/E-governme/Atti-dell-/European-Innovation-Scorebord-12_01_.pdf>

The World Bank (online). Available from: <http://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS/countries/1W-LT?display=graph>

Tvaronavičienė, M. 2014. If industrial sector development is sustainable: Lithuania compared to the EU, *Entrepreneurship and Sustainability Issues* 1(3): 134–142. DOI: http://dx.doi.org/10.9770/jesi.2014.1.3(2)

United Nations economic commission for Europe**.** 2003. Towards a knowledge based economy. Lithuania. Country readiness assessment report 2003. Geneva and New York. Available on the Internet: <http://www.unece.org/fileadmin/DAM/ie/enterp/documents/coverlithua.pdf>

Vasiliūnaitė, R. 2014. Sustainable development: methodological approaches toward issues, *Journal of Security and Sustainability Issues* 3(3): 69–75. DOI: http://dx.doi.org/10.9770/jssi.2014.3.3(6)

Vosylius, E.; Rakutis, V.; Tvaronavičienė, M. 2013. Economic growth, sustainable development and energy security interrelation, *Journal of Security and Sustainability Issues* 2(3): 5–14. DOI: http://dx.doi.org/10.9770/jssi.2013.2.3(1)

White, A. 2005. *Business Development Support in Science Park. Aston Science Park*. UK. Birmingham technology Ltd.