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INNOVATE AND PROSPER: BUILDING THE PRESTIGE OF THE GREATER ROCHESTER NY REGION

In this paper we present an example of timely and successfully applied activities that built the diverse economy of the greater Rochester area after its large industries melted, and spurred its economic development into one of the most successful in the nation. An outstanding example of the academia-industry collaboration is CEIS at the University of Rochester, with return in investment ratio of 30:1, i.e. 30 mln dollars in investment returns per every million dollars. The collaboration is essential for emerging technology industries, which are hard to replicate and as such are the drivers for sustainable competitive advantage of the area. Strengths intrinsic to the Rochester community can be recognized in other regions; however, lack of the long-term visions and effective activities that support sustainable diverse and competitive economy prevent their long-term robust economic development, competitiveness, and growth as seen in the Rochester greater area.

Keywords: economic development, economic impact, innovative, sustainable competitive advantage.

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ІННОВАЦІЇ ТА ПРОЦВІТАННЯ: ФОРМУВАННЯ ПРЕСТИЖУ РЕГІОНУ (ЗА ДАНИМИ РАЙОНУ ВЕЛИКОГО РОЧЕСТЕРА, НЬЮ-ЙОРК)

У статті наведено приклад своєчасних і успішних заходів зі зміцнення економіки району Великого Рочестера після краху великої промисловості і його економічний розвиток до рівня одного з найуспішніших у країні. Видатний приклад наукового-промислового співробітництва — лабораторія Університету Рочестера, з поверненням інвестицій на рівні 30:1, тобто 30 млн. дол. США на кожен вкладений мільйон. Співпраця має важливе значення для унікальних галузей промисловості, які розвиваються і служать факторами стійкої конкурентної переваги в цьому районі. Досягнення Великого Рочестера можуть бути взяті за зразок іншими регіонами, однак відсутність довгострокових концепцій і ефективних заходів, які підтримують стійку диверсифіковану конкурентну економіку, перешкоджає довгостроковому сталому економічному розвитку, конкурентоспроможності та зростанню.

Ключові слова: економічний розвиток, економічні наслідки, інновації, стійка конкурентна перевага.

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ИННОВАЦИИ И ПРОЦВЕТЕНИЕ: СОЗДАНИЕ ПРЕСТИЖА РЕГИОНА (ПО ДАННЫМ РАЙОНА БОЛЬШОГО РОЧЕСТЕРА, НЬЮ-ЙОРК)

В статье приведен пример своевременных и успешных мероприятий по укреплению экономики района Большого Рочестера после краха крупной промышленности и его экономическое развитие до уровня одного из самых успешных в стране. Выдающийся пример научно-промышленного сотрудничества — лаборатория Университета Рочестера, с возвратом инвестиций на уровне 30:1, т.е. 30 млн. дол. США на каждый вложенный миллион. Сотрудничество имеет важное значение для развивающихся

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уникальных отраслей промышленности, которые служат факторами устойчивого конкурентного преимущества в этом районе. Нарботки Большого Рочестера могут служить примером для других регионов, однако отсутствие долгосрочных концепций и эффективных мероприятий, которые поддерживают устойчивую диверсифицированную конкурентную экономику, препятствует долгосрочному устойчивому экономическому развитию, конкурентоспособности и росту.

Ключевые слова: экономическое развитие, экономические последствия, инновации, устойчивое конкурентное преимущество.

Introduction. Collapse of corporations that dominate the economy of a region can have a devastating impact on economic growth and development. It is hard to define a single variable that may be used as a perfect measure for a region's economic decay while a number of job positions are lost. However, a good descriptive measure may be a drop in the population growth, perhaps the best criterion of a city's well being, and a level of an urban decay reflected through vacant office towers and abandoned retail space. Detroit and Cleveland are vivid examples of metropolitans that turned to a mere shadow of once vibrant industrial cities. Fortunately, there are the opposite examples where a region survived and even thrived after industrial giants that reigned over the economic development of the region encountered "a kiss of death".

Reasons for successful survival are complex and unique to a region's utilization of its potentials. In this paper we discuss potentials that have been employed for the successful economic development in the greater Rochester New York (NY) area, after the decline of its 3 dominant employers: Kodak, Xerox, and Bauch & Lomb. Our particular focus is on the role of the Center for Innovative and Emerging Sciences (CEIS), at the University of Rochester, NY. In diverse economy of the region, CEIS is one of many things that make economic development successful, however, our interest in CEIS lies in its substantial involvement in establishment, development, and competitiveness of high-tech companies. We also discuss Serbian potentials and weaknesses that obstruct possibility to successfully adapt and implement the Rochester recipe.

Terminology. Innovation is more effective use of products, processes, technologies, or ideas. Products, technologies, and ideas are often novel. The accent of invention is on creation of new or more effective products, processes, technologies or ideas.

Economic development is economic wealth of a region for the well-being of its inhabitants. Economic wealth refers to the changes and developments in all segments of society such as, but not limited to cultural, social, health system, educational system, adoptions of new technologies in industry, or policies that lead to a general improvement of living standards. Thus, economic development is a term that is mostly descriptive and not easily quantifiable. *Economic growth* is an increase in income per capita or increase in gross domestic product (GDP). *Economic impact* is an effect of a policy, program, project, activity or event on the economy of an area.

Creative destruction refers to the linked processes of the accumulation and annihilation of wealth under capitalism.

The Rochester NY region rankings. The city of Rochester is located in the State of New York (NY) in the United States of America (USA). The city was established at the beginning of the XIX century. Rapid economic development earned Rochester a title of the nations first boomtown. Initially known for flourmills located along

Genesee River, Rochester developed into a modern city that, with the greater region, has become a manufacturing, cultural and educational hub. History records show long tradition of adaptability, entrepreneurship and innovation. According to 2010 census Rochester's metro population is approximately 210,565, and the greater Rochester's population is 1,054,322.

The Rochester area has diversified economy, relatively low unemployment, and stable real estate market. It is ranked first in job growth among mid-sized US metropolitan areas (Business Facilities Magazin, July 2011), it is among top 20 places to start over and the 15th strongest job market in the USA (Business week, November 2010), the 7th fastest recovering city, the 3rd best place to raise a family and 5th for patents per capita (Forbes, 2010). The Brookings Institute consistently ranks Rochester's economy among strongest in the nation.

The Greater Rochester area is the home to 18 leading educational institutions, such as the University of Rochester (UR), which is declared one of the 25 new Ivy League schools. The public schools of the Rochester region are rated as sixth best nationwide, and higher education institutions are reportedly ranked among the top US universities. Thus, it comes natural that Rochester is among top 10 smartest cities in the US. "Business Facilities" chose Rochester as one of the top places in the country to do business because of the alternative energy leadership and the nation's highest Intellectual Density Quotient (IDQ) (Business Facilities, June 2010). Introduced by Rochester Business Association the IDQ measures a region's capacity for productivity, which includes problem solving, innovation and creativity, and sustainable economic prosperity. The calculation of the IDQ is based on the population, the number of companies in the city on the "best places to work" list (either number one and/or among the top 10 ranking), the percentage of the population enrolled in college, the percentage of the population classified as knowledge workforce, the number of patents issued per 1,000 people, and the mean annual wage estimate for all occupations. Based on the IDQ calculation, Rochester outperforms communities multiple times its size, for example, New York City, NY, Boston, MA, or Washington, DC (see Table 1).

Table 1. IDQ values

	Rochester, NY	Boston, MA	San Francisco, CA	Austin, TX	Seattle, WA	Washington, DC
TP	1,054,445	4,560,689	4,345,320	1,728,307	3,449,059	5,610,082
#1/1mil	3.79	0	0	0	0	0
Top10/1mil	10.43	0.66	1.15	1.74	1.45	1.25
%CE	5.1	4.0	4.0	5.8	3.4	2.5
%KWF	26.7	29.8	27.6	21.7	27.4	28.0
P/1000	4.97	3.73	5.63	5.93	4.26	1.23
MAW (\$)	42,270	56,560	63,290	45,180	53,240	61,530
IDQ	50.98	38.19	38.38	35.17	36.51	32.98

TP – Total Population (U.S. Census Bureau, 2010), #1/1mil – number of number one “best companies to work for” rankings per 1 mln residents (2007-2011) (Fortune's 100 Best Companies to Work For in America, 2011), Top10/1mil – number of top 10 “best companies to work for” rankings per 1 mln residents (2007-2011) (Fortune's 100 Best Companies to Work For in America, 2011), %CE – percent of population currently enrolled in college (IPEDS College data 2009-2010), %KWF – percent of population classified as knowledge workforce (Bureau of Labor Statistics, Occupational Employment Statistics, May 2010), P/1000 – patents issued per 1000 residents (U.S. Patent and Trade Office, 2006-2010), MAW – mean annual wage estimate for all occupations (U.S. Bureau of Labor Statistics, Occupational Employment Statistics, May 2010), IDQ – intellectual density quotient. $IDQ = \#1/1mil + Top10/1mil + \%CE + \%KWF + P/1000$.

World-renowned corporations — Kodak, Bauch & Lomb, and Xerox originated from this city. These corporations are known for extensive research in their respective fields, and manufacturing of the highest quality products. Only 3 decades ago Kodak, Bauch & Lomb, and Xerox employed 60% of Rochester's workforce. Today these companies account for 6% of the local employment. Despite the reduction, more people are employed in the region than there were in the eighties. For example, during 3 decades Kodak's employment dropped from over 60,000 to fewer than 7000, while the community gained over 90,000 jobs. Many jobs lost at Kodak stayed at community with other companies. For illustration, Canadian investment firm Onex Corporation purchased Kodak's health-imaging unit and renamed it to Carestream Health.

A mere presence of a dominant company may suffocate development of new or existing small and middle size companies. The Rochester society recognized the risk about two decades ago. To prevent possible consequences of the risk, with the help from local government, academia, and non-profit organizations, the community has started to train entrepreneurs. In the process they created a network of private and nonprofit partnerships that diversified the economy. Since 1996 51 startups were created based on the UR technologies, with 38 still active today. High-skilled workers let go by Kodak over the years, new graduates, and families that has been attracted to the city's many offerings from stable real estate market, cultural institutions to educational facilities, create a valuable labor pool for start-up and existing companies. Innovative approach and academy-industry collaboration have given an active role to research facilities in economic development, and enabled the University of Rochester to become a successor to the largest employers in the area.

Academic-Industry collaboration: an Example of CEIS and NYSTAR Symbiosis and its Economic Impact. Frequently, the first wave of austerity measures in large corporations cuts back the finance of the research and development (R&D) sector. Ironically, this crumbles the foundation for the innovative manufacturing, product development, and improvement progress. Further, it is often not economical or possible for small and middle size businesses to develop new technologies in-house. Thus, it makes perfectly reasonable to join forces with research institutions, and to direct research facilities to actively contribute to the community's economic development. In addition, research and educational institutions have greater access to funds from federal and state support programs. The recent trends in the funding programs eligibility policies are changing to encourage academic-industry collaboration. The New York State Development Division of Science, Technology and Innovation established a NYSTAR programs with the mission to support sustainable economic development and to enable symbiosis between research institutions and regional economics in the State. The programs include setting up: Centers of Excellence (COE), Centers for Advanced Technology (CAT), Regional Technology Development Centers (RTDC), and High Performance Computing Program. The CAT development program supports collaborative technology-based applied research and technology transfer in commercial relevant technologies. The program is designed to initiate research and economic development in New York State, to promote national and international research collaboration and innovation, and to better leverage the State's research expertise and funding with investments from the federal government, foundations, businesses, venture capital firms, and other entities.

Table 2. The CEIS NYSTAR-verified Economic Impact

Year	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	Total
Increased Revenues, \$	104,756,800	107,723,300	56,224,541	7,244,229	9,287,081	285,235,951
Cost savings	10,533,460	9,543,230	7,891,280	5,933,200	3,842,000	37,743,170
Funds Acquired, \$	7,002,500	12,822,500	4,752,700	4,260,000	11,801,946	40,639,646
Capital Improvements	415,000	94,000	18,682,720	518,235	5,591,664	25,301,619
Job Value, \$	1,201,739	4,352,632	2,551,074	3,022,380	4,559,006	15,686,831
New Jobs	14.7	35	20.5	22.5	25.5	118.2
Retained Jobs	4.5	37	17	20.5	42.3	121.3
Total Impact, \$	123,909,499	134,535,662	90,102,315	20,978,044	35,081,697	404,607,217
Total Cumulative Impact, \$	123,909,499	258,445,161	348,547,476	369,525,520	404,607,217	404,607,217

The economic impact is determined and verified by the state. Note that the drop in revenues in 2009 is due to the economic recession in 2008 in the US. However, the 30:1 ratio in the investment return is preserved. Large numbers in 2006 and 2007 are dominated by large impact projects from Kodak and Bauch & Lomb (CEIS 2009-2011 Annual Reports).

Table 3. CEIS Funding (CEIS 2009-2011 Annual Reports)

Year	1994-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
Research Expenditures, \$	4,795,583	239,544	230,447	217,645	218,807	94,718
Research-supported Operational Expenses, \$	1,099,111	204,274	219,127	220,956	254,037	140,705
Center Operational Expenses, \$	3,988,638	555,533	536,403	566,589	520,023	678,531
Total NYSTAR, \$	9,883,332	999,350	985,977	1,005,190	992,867	913,954
OTHER SOURCES OF FUNDS						
Cash from Companies, \$	10,498,848	1,779,318	1,697,103	1,181,679	1,208,521	954,911
Other Sources, \$	2,367,281	0	82,760	404,877	161,304	367,251

Center for Emerging and Innovative Sciences (CEIS) at the University of Rochester is one of the 15 Centers for Advanced Technology (CAT) supported by NYSTAR program, jointly sponsored by the UR and the Rochester Institute of Technology (RIT). The mission of the CEIS is to identify the areas where the interests of primary investigators (PIs) intersect with industry corporate partners, and to match a company needs to the faculty members with proven records of accomplishment. The desired outcome is company-sponsored university research projects with tangible technology deliverables. In addition to making a connection, the Center helps fund the research. The majority of the Center's funds are spent on providing matching grants. When the Center makes the connection between the University researcher and the company, for every \$2 that the company brings, the Center is able to fund \$1 of state money. Thus, the Center helps the company to leverage resources better. One of the criteria in selection of prospective projects is a potential of economic impact. Researchers at the University are encouraged to work together in the early application process to do the best job they can in estimating what potential eco-

conomic impact is going to be. The state evaluates the economic impact of the NYSTAR CAT program in terms of increased jobs, retained jobs, capital improvements, and growing revenues. Tables 2 and 3, Figures 1 and 2 (CEIS 2009-2011 Annual Reports) demonstrate that CEIS is showing outstanding economic impact according to the variables verified by state, with continuous return in the investment ratio of 30:1, i.e. 30 mln dollars of return per each million invested. During 2010-2011 CEIS achieved the annual economic impact of \$35 mln, and helped to create 26 new jobs and to retain 42 jobs through supported projects.

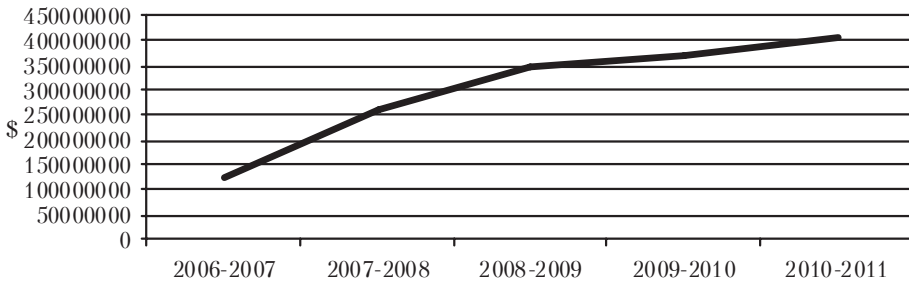


Figure 1. Total Cumulative Impact of CEIS in the last 5 years (CEIS 2009-2011 Annual Reports)

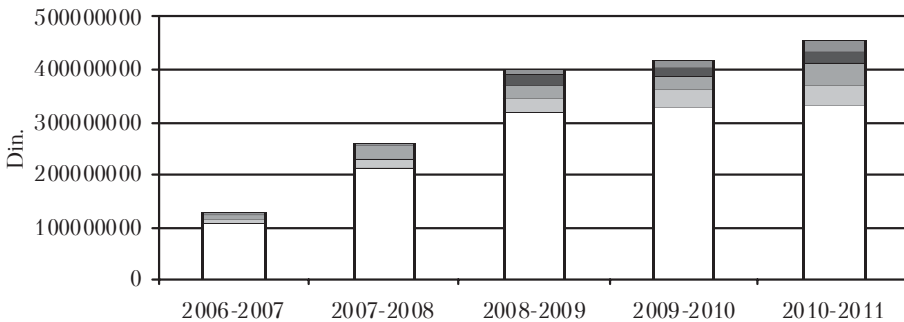


Figure 2. Factored NYSTAR evaluated cumulative economic impact of CEIS over the last 5 years (CEIS 2009-2011 Annual Reports)

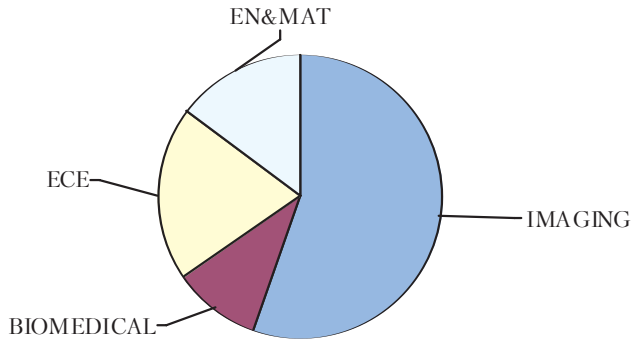


Figure 3. The 2011-2012 CAT projects' industry distribution (CEIS 2009-2011 Annual Reports)

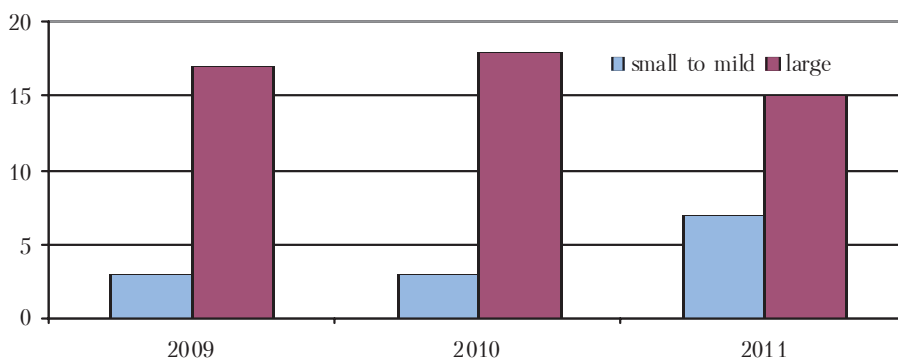


Figure 4. CEIS corporate partners three-year comparison.
It is clear that attention to small and mild companies is growing
(CEIS 2009-2011 Annual Reports)

One may argue that the program enables companies to save on expense of destroyed jobs. At the beginning of collaboration, companies usually cannot afford to hire additional full-time engineers. With the savings and through collaboration a company can afford expensive piece of machinery, product development, economic growth, and eventually ability to create new job positions. Although, it is hard to see at the beginning, the collaboration does create jobs.

The starting focus of CEIS - imaging continues to cover over 50% of the supported projects. The rest of the support the Center distributes to the 3 industries that are recognized as highly important for growing economy of the region: biomedical technology other than imaging, electrical and computer engineering, and energy and materials (Figure 3). The approach to all the areas is the same: identify emerging cluster industries, its faculty and companies, recognize specific opportunities for collaboration, and evaluate the economic potential and consider the collaboration support.

Due to the emerging role of small businesses as drivers for innovation and economic growth, it can be observed that the center of gravity of the company size that collaborate with CEIS is shifting toward small to mild companies (see Figure 4).

In collaboration with the Office of Technology Transfer, CEIS ensures efficient technology transfer through activities such as educating the faculty in writing patent applications that are more attractive for licensing. In addition, CEIS launched Industrial Speaker Series which increased informal relationships and visibility of students. The series also raises the faculty awareness about challenges and problems the industry faces and helps direct research possibilities to address identified market needs. Also, the connections established through student internships help the region keep young educated workforce after graduation.

The philosophy behind the collaborations is to establish and keep a productive ongoing relationship and team effort. The company does not hand over the research responsibility to University. Rather, there is a very close interaction between the University and the company researchers. Such approach helps building partnerships with the projects very often evolving from one level to the next.

Other important roles of CEIS are consulting and continuous education. Together with Simon School of Business, CIES provides a short-term expert business

assistance with market research and analysis, business plans, advertising, information systems, and other business challenges. In collaboration with its university partners CEIS organizes seminars and tailored trainings in business skills, strategies, and emerging technologies.

Opposite Example. The example of the Rochester region shows that as much as intrinsic strengths are important, so are good vision, collaboration, and political will.

The most common reasons for failure are the lack of: long-term vision, timely applied policies, innovative approaches to collaborations, research, development, and manufacturing and adequate stimulating measures to support economy development through period of creative destruction. For example, 2 decades ago, ex-Yugoslavian Republic of Serbia had similar intrinsic strengths: dominant employers, excellent education system, highly skilled workforce, knowledge economy sector, quality of life, tradition of entrepreneurship and innovation, geographic proximity to major markets, manufacturing sector, and strength in exports and international trade. Due to changes large employers collapsed leaving many unemployed; education system suffers endless revisions, policies and incentives seldom help to create business friendly environment. Inert bureaucratic system and corruption, lack of long-term vision, ignorance of political establishment and weak leadership that rather searches for scapegoats then solutions prevent healthy economic development. Unpopular economic measures decrease employment rate and force highly skilled workforce and young professionals leave the country. The measures are often directed to support a survival from quarter-to-quarter.

Nevertheless, there are encouraging examples of businesses that adapted to changes and redirected attention to abundant domestic potentials, in particular start-ups that resulted from the academic-industry collaboration. Small disadvantage is that the majority of the companies provide services for foreign companies. Although a company has to be competitive to be outsourced by other companies, it is certainly not one of the parameters that help building robust long-term economy. Cheap quality labor, cheap electricity, or best transportation are certainly advantage, but those can be easily replicated. Providing services that can be done in-house, but are subcontracted due to a foreign company's internal business politics can hardly be called research collaboration. Additional effort has to be directed to help domestic small and middle size companies explore how a research structures of universities can be used for them to become and stay competitive. A model that seems to work well is CEIS.

Conclusion. Modern Rochester is a renowned international center of higher education, and medical and technological development. A solid housing market, relatively stable employment, enviable cost of living and quick commutes make the Rochester region among the most affordable and attractive to live. Long-term investment politics in education, culture, and community, along with incentives keep Rochester attractive to educated work force.

High IDQ ranking explains why the region has been the site of many important inventions and innovations in consumer products, and proves that highly skilled and educated workforce is a key to long-term economic success. As the large industry melted, by necessity the economy of the greater Rochester area had diversified. The CEIS is a part of the strategy to help build high technology parts of the economy by

encouraging university-company interaction. Industry-university collaboration add to better use of local intellectual capital and to faster adaptability of business development trends. Establishment of the companies with high technologies that are hard to replicate, opens the opportunity to build enterprises with a sustainable competitive advantage (SCA) which is very important for long-term robust economy. Let us illustrate the SCA with the following example. Any region with fertile lands and smart people can grow corn. But with the industry based on high technology that has very specific knowledge, patents and know-how, it is very hard for other regions to just show and start competing. The emphasis of places like CEIS is on building the companies that have very substantial barrier to entry based on technology learning curve, which enables a sustainable competitive advantage.

Regions' ability to prosper economically is dependent on the ability to harness the benefits of changes. It is common to speak of the knowledge economy in which business success depends on the ability to manage innovation and technological changes. Thus, regions enact all kind of policies to lure and support innovative firms and to create SCA.

The intrinsic assets of the Rochester area, such as agriculture, manufacturing in a number of segments, advanced technology, associated with good vision, collaboration, and government's help, turned over the melting of the dominant employers into successfully implemented innovative opportunity. The keywords to Rochester's sustainable economics are: domestic potentials and strengths, adaptability, long-term vision, private and non-profit sector collaboration, incentives, innovations, hard-to-replicate high technology sectors, and diversified economy. Due to such approach, despite the unstable economy, all economy segments of the region have been demonstrating remarkable results.

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