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# Cluster Policies in Energy Efficiency Management in Regional Innovative Strategy of Sustainable Development

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**Abstract.** The article introduces modern approaches to catalyze energy efficiency efforts in Russia and Krasnodar region in particular – clean energy cluster concept and low-emission and climate-resilient development strategies (green LECRDS). The potential of Krasnodar region for developing clean energy and low-carbon sustainable development strategies were analyzed briefly. The key role of academic and research facilities in developing and applying of such innovative strategies was highlighted. Basic principles and methodological approaches of clean energy cluster formation in the framework of regional strategy of low-carbon sustainable development in Krasnodar region were proposed.

**Keywords:** Energy efficiency; clean energy cluster; sustainable development; regional energy strategy; innovative approaches.

## Introduction

Our need for clean, sustainable, safe, and secure sources of energy must be balanced against the often competing interests of the economy, environment, and national security. Recent scenarios in world energy production («New policies scenario» and «450 scenario») and trends for low-carbon sustainable development lead to rapidly increasing demand for new integrated approach to the regional energy strategies with strong emphasis on wide implementation of "green" technologies, including utilization of renewable energy sources, "green" building technologies, etc. [1]. According to various assessments, achieving dynamic economic growth will require increased energy efficiency and greater use of renewable energy in Russia and Krasnodar region in particular. To catalyze energy efficiency improvements, innovative instruments in regional policies should be introduced.

The negotiating process at the Copenhagen conference on climate change failed to produce an agreement. Although Copenhagen did not result in a legally binding agreement, the ensuing developments have shown that climate change is firmly on the global political agenda. Industry will be challenged to reduce their own emissions, as well as understand key issues, such as adaptation and geo-engineering that will impact the public and private sector. The accord includes, as an inspirational goal, the limiting of global warming to below 2 $^0$C and commits countries to take action to meet this objective. It accepts the need for enhanced action on adaptation to climate change, with developed countries committing to provide adequate financial and other kinds of support to developing countries [2]. Later, the World Energy Council has decided to launch a new global energy scenarios exercise following the Congress in Montréal 2010 [3]. According to this study, the scale and complexity of the energy sustainability challenge is increasing. This in turn, has constrained the pursuit of energy sustainability measures. It was hoped that this new energy scenarios work will provoke and stimulate debate and discussion around emerging uncertainties and the potential solutions for meeting the energy demands of the world in a sustainable manner.

Climate Pragmatism, a new policy presented in the report released in July 26$^{th}$, 2011 by the Hartwell group, introduces an innovative strategy to restart global climate efforts after the collapse of the United Nations Framework Convention on Climate Change (UNFCCC) process [4]. This pragmatic strategy centers on efforts to accelerate energy innovation, build resilience to extreme weather, and pursue no regrets pollution reduction measures – three efforts that each have their own diverse justifications independent of their benefits for climate mitigation and adaptation. The

effectiveness of such strategy, paradoxically, does not depend on any agreement about climate science or the risks posed by uncontrolled greenhouse gases.

Recent efforts to tackle climate change often have been focused on isolated, distinct and competing goals and actions on mitigation (lowering emissions) or adaptation (reducing vulnerability) [5]. However, long-term climate change management requires a shift from sectoral perspectives to a holistic approach that incorporates climate change mitigation and adaptation into environment and sustainable development goals and planning processes. Such an approach recognizes that climate change responses are closely intertwined with development choices and actions involving multiple sectors, stakeholders, and ecosystems.

Though UNDP and other international non-profit organizations have been supporting Russia's climate change and energy efficiency priorities through actual development projects, regional economics suffer from lack of integrated approach to the implementation of green, low-emission and climate-resilient development strategies (green LECRDS) and innovative "green" technologies.

Green LECRDS, the completely new development methodology to Sochi region, will help guide conventional and innovative sources of sustainable development and climate financing, and assist local authorities, Russian and regional government in implementing, monitoring, and catalyzing low-emission and climate-resilient development projects and programmes. Green LECRDS' are considered to be the key elements of the Integrated Territorial Climate Plan (ITCP), which could be one of the most significant parts of Sochi-2014 Green legacy.

Some projects in these field were initiated in Krasnodar region and particular in Sochi, the capital of XXII Winter Olympic games, by UNDP, GEF, Russian government, State Corporation "Olympstroy" and National Organization Committee for the Sochi Olympics – "Greening 2014 Sochi Olympics: A Strategy and Action Plan for the Greening Legacy", "Standards and Labels for Promoting Energy Efficiency in Russia" and others.

It's obvious, that regional authority should obtain a tool, which makes it possible to implement such plans and strategies and gives a considerable boost to regional economic growth, providing a significant ecological and social effect. Also the regional economy needs a community instruments supporting networking between clean energy clusters and collaboration between cluster-relevant organizations across EU and Russia. We introduce a concept of Clean energy cluster, which is completely new to Krasnodar region. Clean energy is one of the fastest growing industry segments throughout the world with strong job growth potential and tremendous economic, environmental and strategic national importance. However, Russian clean energy industry faces a range of obstacles including inconsistent policy drivers, large capital investment gaps and intense global competition.

The Krasnodar region offers a unique mix of assets that, if properly applied, can support a highly competitive environment for clean energy businesses and enhanced economic activity. While Krasnodar region offers a natural base for the growth and attraction of clean energy companies, the region is not without its challenges and it will take a concerted regional effort and decisive leadership to take the region from its current position as a potential clean energy growth center to its role as a national clean energy industry hub.

Krasnodar region possesses numerous key institutions and resources that could support the growth of the clean energy industry. The Krasnodar region is home to several highly capable and reputable universities (Kuban State University of Technology, Kuban State University, Kuban State Agrarian University, Sochi State University and others) that maintain programs supportive of the clean energy industry. Krasnodar region offers strong resources for the development of the solar industry. Other factors determining suitability besides solar resources include access to required infrastructure, proximity to markets and suppliers, the presence and support of key institutions and access to a skilled workforce.

Krasnodar region features several locations that offer high amounts of geothermal resources. However, the utilization of these resources for energy production is challenged by several factors that may prevent, limit or delay the installation of geothermal infrastructure. Krasnodar region has also an access to abundant biomass resources available throughout the region. Access to significant biomass resources can often determine the appropriateness of certain related clean energy activities within a region.

Academic and research facilities are considered to be the essential elements of the core of a cluster. There are some successful examples of such innovative activities - Baltic Sea Region "Energy efficiency and renewable energy sources" cluster, some clusters and networks of clusters in Europe and USA [6]. Such project, based on cluster approach, effective utilization of renewable energy sources, “green” sustainable building principles and integrated energy-efficient measures, was initiated in Sochi State University (SSU) in November, 2011.

Leading scientists and consultants from SSU have an outstanding experience in strategic planning for Sochi region – from Ecologically-safe development concept of ski resort “Krasnaya Polyana” (1999-2000) to Sochi Master Plan (2008-2009) and implementation of Sochi 2014 Environmental strategy [7]. SSU also has an extensive experience of participation in various scientific programmes, including Tempus and 7FP, and carries out scientific researches in the following fields: integrated management of the tourist-resort coastal zone according the principles of the sustainable development; economics, organization, management, planning and scientific prognostication of tourism development, strategic management of the regional tourism systems, urbanization, recreational economy, pedagogics, building and construction, renewable energy, ecology and environment [8-12].

Among the main scientific projects - projects of Ministry of Education and Science of the Russian Federation «Research of the process and peculiarities of the territorial and recreational socio-economical development», «Study of permissible kinds of ecological tourism in the protected natural territories for the health rehabilitation», «Development of the theory and the methods for the impact assessment of marinas on the aquatic environment of the coastal zone of the sea resorts on the basis of modeling»; international projects within the programmes TEMPUS, TACIS и CEPRA; grant projects of Russian Foundation for Basic Research «Methodology of innovative process management in the resort and tourism area of the Azov and Black sea coast of Russia»; project ordered by the regional authorities and municipalities - «Concept of the development of the special economic areas in the Krasnodar Region», «Methodological researches in the tourism industry» and so on.

In addition to planning, management and research experience, a set of building, designing, ecological and technological projects were put into action in Sochi region. These projects include solar collector, heat pump and integrated automation projects [10].

As considered above, the growth of industry clusters also requires a regional effort. Regional government officials, economic developers, business leaders, and the public must be united in their vision and enthusiastic in their support to grow regional representation in any industry cluster that is viewed by the region as desirable or as important to the region’s economic future.

An analysis of regional growth trends, resource availability and industry development patterns will serve as a base in evaluating Krasnodar region’s clean energy clusters. This, in combination with an examination of the region’s labor force and clean energy supply chain, will facilitate the development of recommended strategies for building upon these clusters in support of the region’s clean energy industry.

The first step towards formation of regional clean energy clusters in the region is an extensive stakeholder engagement process to identify the key assets, challenges and opportunities that currently affect the clean energy industry in Krasnodar region and may impact the future of the industry in the region. Further researches should examine various regional, state, national and international trends and opportunities and draws from numerous sources, both public and private.

Cluster’s formation should began with an inventory of existing clean energy assets, clean energy workforce development needs, regional support organizations and regional university, and other workforce development assets in order to identify sources of competitive advantage as well as specific gaps that need to be filled. Some methods, manuals and guides should be prepared in order to provide the complex renewable energy program evaluation from the perspective of a social and ecological rather than economical effect. Such documents suggest how to ensure that evaluation activities are useful, cost-effective, and well-received by program staff, policymakers, and stakeholders. They discuss how to select an evaluator of a particular clean energy program, and recommend how to approach and choose among different types of evaluations: needs and market assessments, process evaluations, outcome evaluations, impact evaluations, and cost-benefit evaluations.

In parallel to the regional clean energy asset inventory and workforce analysis, the project should conduct an analysis of clean energy industry growth patterns within the Krasnodar region.

The clean energy industry is defined as those businesses engaged in or related to the production of clean energy and/or in the development or application of energy efficiency technologies. The various components of the industry are divided into three primary segments, including: 1) Energy efficiency; 2) Renewable energy; 3) Alternative fuels technologies.

We think that proposed methodology of research should utilize an approach that will evaluate the clean energy industry within the Krasnodar region, drawing on multiple perspectives in order to develop a clearer picture of clustering and capacity for growth. The steps of this analysis include the following:

1. Review location of known Clean energy companies in Krasnodar region:

a) Selection of companies based on materials provided by the client and included those for which required information was fully available.

2. Clean energy-related industry growth patterns:

a) Analyze growth patterns of employment and establishments in clean energy-related industries;

b) Identify areas of significant or unusual growth in clean energy-related industries.

3. Other Clean energy-related activity and resources:

a) Identify factors that may indicate or support current and/or future clean energy growth -

- Green standard's registered buildings;
- Solar, Geothermal, Biomass and other Clean energy resources;
- Energy distribution infrastructure.

4. Institutional assets and opportunities for Clean energy industry growth and development:

a) Identify location of universities, research institutions, and other assets that may support the clean energy industry within the region.

5. Cluster identification:

a) Compare with findings from interviews, focus groups, previous studies and client input;

b) Identify primary Krasnodar region Clean energy clusters.

In order to achieve the main goals of proposed research, the efforts should directed to:

1) assess the current presence of clean energy-related industries and its change over time;

2) determine if and where this group of industries is growing within Krasnodar region;

3) determine if growth patterns support a particular segment of the renewable energy industry;

4) identify key locations for growth in renewable energy-related industries that may exist in the region.

The primary areas of analysis are described in more detail below.

- Regional analysis:

1) Assess current employment and establishment levels;

2) Assess employment and establishment % growth;

3) Assess employment and establishment Total growth;

4) Assess employment and establishment Comparative growth (relative to data for all industries taken as a whole).

- Municipal district analysis:

1) Identify key contributors and outliers (municipal district-by-municipal district) based on findings from Regional analysis;

2) Compare to growth in that municipal district for all industries;

3) Determine if growth is consistent across and/or within individual industry segments.

- Industry segment analysis:

1) Review regional and municipal district analysis on the basis of individual industry segments (i.e. Renewable energy, Energy efficiency, Alternative fuels and vehicle technologies);

2) Identify indications of growth in a particular segment and within a particular municipal district.

- Identification of key areas of growth:

1) Compare findings to identify growth areas

2) Identify reliable and representative data points and growth indicators.

This analysis functions best when coupled with additional means (both quantitative and qualitative) of evaluating the location and potential strength of clean energy clusters. For this reason, the subject should be approached from multiple angles in order to develop a clearer picture of clustering within the Krasnodar region.

Drawing upon the analysis of the region's potential clean energy clusters, industry assets, labor force and supply chain, we present a set of goals, strategies and key economic development initiatives meant to leverage the region's clean energy assets, address economic challenges and support the attraction of target niches within the clean energy industry. We suppose that future recommendations should be organized around the following six goal areas each of which are key to the development of a strong clean energy industry cluster in Krasnodar region.

The six goals highlighted below are rooted in the unique conditions found within the Krasnodar region and offer a clear path forward as the region continues its efforts to support a prosperous clean energy economy:

- Expand and reinforce entrepreneurial culture and support system.
- Leverage Krasnodar region's natural, institutional and cultural assets to promote opportunities in Clean energy.
- Foster increased inter-institutional cooperation focused on Clean energy technologies and market development.
- Attract, train and retain educated professionals necessary for the support and expansion of the Clean energy industry.
- Aggressively pursue new business opportunities.
- Focus on trends to regional low-carbon environment-friendly sustainable development.

**Conclusion.** As discussed above, Winter Olympic Games will give an opportunity to develop regional greening recommendations and Action Plan for energy efficiency, Sochi Carbon Offsets Programme as a Green legacy of Sochi-2014 Winter Olympics. But in the case of successful implementation of the proposed approach it will also give a chance to gain more benefits in the long-term perspective – to build a regional strategy of low-carbon sustainable development with particular emphasis on clean energy and environment aspects.

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## Кластерный подход к управлению энергоэффективностью при реализации региональной инновационной стратегии устойчивого развития

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**Аннотация.** В статье представлены новые подходы к стимулированию активности по повышению энергоэффективности экономики в России и Краснодарском крае, в частности – концепция энергоэффективных кластеров и низкоэмиссионные климатически нейтральные стратегии развития. Кратко проанализирован потенциал Краснодарского края по развитию экологически чистой энергетики и стратегий низкоуглеродного климатически устойчивого развития. Подчеркнута ключевая роль академических и исследовательских институтов в разработке и внедрении рассматриваемых стратегий. Предложены основные принципы и методологические подходы к формированию энергоэффективных кластеров в рамках реализации региональной стратегии низкоуглеродного климатически устойчивого развития в Краснодарском крае.

**Ключевые слова:** энергоэффективность; энергоэффективный кластер; устойчивое развитие; региональная энергетическая стратегия; инновационные подходы.