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Clean Energy Application for Biodiversity Security

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Abstract In the work the research carried out on forest safety in Pirgulu by applying three renewable energy sources was described. Accordingly measurements and calculations have been done by me in this area for altering fire wood into green energy in order to supply energy demand of the local population. After measurements average annual high wind speed was determined 12 m/sec. Also average annual solar energy index is defined 110 W/m^2. There are 44415 kg annual biomass reserves in the region. The annual biogas generation on this biomass stock is 1916,5 m^3. That's why CSWBEP (Combined Solar Wind Biomass Energy Plant) was built and tested in the research region and positive results have been obtained.

Keywords Solar Energy, Wind Energy, Biomass, Forest Safety

1. Introduction

1. Forest Safety Demand: All over the world green energy sources application policy is the most actual in solving environmental problems in all regions of the world. Because a lot of developed countries have responsibilities on Kyoto Protocol guideline[1,2]. Now in order to protect the ecosystem of the Planet, greeneries, especially the woodland being the greatest natural complex has important role. In spite of no amenability of the developing countries, majority of such kind of countries aspire to utilize ecological clean energy for increasing social state of the population requiring energy provision more than to prevent ecological hazardous influences to the environment. No depending on the aim, the renewable energy sources application leads environmental and ecological safety. If one of the natural complexes has been lost or is being lost in this case protective measurements should be prepared and realized. Greeneries[3,4] are the main part of the ecosystem and their safeguard has significant importance. Greeneries loss may cause essential changing in the ecosystem that form anomalies in hydrosphere, biosphere and so on. So greeneries are balancing indicator in the natural structure, that's why their security is important for our health and peaceful life.

2. Energy Exploitation Rate: The question arises that if we know this, in this case why natural green lands are being hewed? Of course the reason and cause are clear but the solution of these and prevention of the process depend on each other mutually.

In our present life several reasons appear:

- Utilization of wood for supplying energy demand as fire-wood and wood coal;
- Use of wood for building as floor and other materials;
- Application of wood in making tare and cases for carrying agricultural productions;
- Usage of wood for producing furniture as raw material;
- Utilization of wood for paper industry as raw material;
- Hewing woods and utilization of the land under them by municipalities.

Considering multifunctional natural protective ability of forests, it is clear that development of their security is safety of ecosystem. Forests[4,5] possess permanent development and formation which can't be compared with the duration of human-being's life. It should be taken into account, at the result of wood cutting reforestation demand appears. In its term reforestation takes long time therefore, prevention of the green lands being cut (woodlands) is very necessary. It stands that I should notice forests are being rapidly hewed for supplying energy demand of the population at present. Hewing process has not been realizing by the local population (physical person) and also by the order of the responsible persons (juridical persons) for provision of the heating demand of the proper buildings. In the selected research object as the alternative of the forest wood three main renewable energy reserves have been calculated, due to the energy potentials CSWBEP (combined solar-wind-biogas energy plant) was developed, built and tested.

The next question arises which reason is the strongest one that leads to the woodlands' hewing. Of course heating necessity of the local population and at the same time some organizations and objects especially including military divisions and garrisons? Kinder gardens, village schools, country state offices and individual houses. Therefore initially ecological, economical and effective energy sources should be determined and the utilization mechanism must be established. That's why I've preferred ecological clean, economical beneficial and power effective renewable energy sources (solar, wind and biomass)[6-8]. The research area has sufficient environmental non hazardous energy potential.

3. Natural resources right usage: And the relief, land-

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scape, also cattle wastes in this zone gives opportunity to apply three energies together for protecting woodland of the region. I should mention that the research area is the square of the State Nature Preserve. Whilst the preserve was established some fundamental responsibilities and obligations were put forward in front of the Pirgulu State Nature Preserve. The biomass energy supply percentage is great here. After having determined all three energy reserves, one of the clean energy sources has been determined and was mapped, then given below.

2. Methods and Results

4. Preserve Present Status: At the beginning I've to notice that such kind of research is being firstly carried out by me in Azerbaijan. Because majority of people consider all preserves are being protected by the government officially. Indeed it is no like that historically villages and various settlements located in the zones where are under the preserves now. The movement of the population completely is impossible. So the people are to live around, sometimes inside of the preserves. Pirgulu Preserve is almost like that, when this preserve was established its total square was determined 1521 ha, then the area had been changed, since 2003 year the new decision made the square become 4274 ha. After the extension a few personal land areas were included to the total square of the Preserve. And also around Pirgulu a plenty of villages gathered. Heating supply of these villages has been provided by hewing forest wood. I'm about to say one fact about this woodland, there is «Janut» forest within Pirgulu State Nature Preserve which is well-know with its yew trees (Taxus). These trees are called as red tree among the people and are used for heating and building purpose. The «Janut» woodland is nadir natural complex in flora of Azerbaijan Republic. In Pirgulu that selected as the research object, pilot village has been determined to realize the research. Safali village is situated on the higher place on the mountain above the sea level. The height of the region makes the relief very interesting and compound. Therefore forests have great protecting function in the zone. Natural balance of the processes can only be regulated by the woodlands here. Nadir trees and other medical plants are very necessary in different industry fields and also in saving thoroughly the biodiversity of the preserve. Here there is no any tree wind speed, solar radiation and cattle farming wastes are enough to generate energy for heating houses and supplying hot water provision. In order to produce energy from three sources the combined solar-wind-biogas energy plant was built and located in Safali. Though the experiment place has been selected one village. Whilst calculating and measuring the natural renewable energy potentials three station points were selected during monitoring and measurements. For determining energy output of the very energy plant biomass potential from local cattle-breeding farms in 27 villages (one of them is settlement) located on 600-2200 m above the sea level have been calculated and defined. Almost solar energy potential of the above said villages was determined at the result of long term actinometric, pyranometric measurements carried out in the region. In the villages being situated on 600-2500 m above the sea level anemometric measurements were realized then wind energy potential was calculated due to the proper method. Measurements and calculation gave perfect result for increasing renewable energy development and providing ecological cleanness of the environment, reducing and at the same time prevention of hewing and cutting processes in mountainous forests in Pirgulu woodland. While solving one problem (energy demand question) we manage to solve other problems together. It is the first time in the exact region of Azerbaijan Republic these renewable energy sources have been measured, processed, calculated and mapped. So I'm going to realize my research in all regions of our Republic for preparing renewable energy potential maps which are to be useful for the new energy sector that will provide ecological safety and economical effective for the country. I must mention that none of the renewable energy potential of Azerbaijan is accurately for developing this sector easily. Though the State Program was signed in 2004 October 21 by the President of Azerbaijan Republic, the initial renewable energy potential calculation wasn't realized. Utilization of renewable energy potentials all over the world is one of the most actual questions. The final catastrophes showed once more that security in energy sector is very important. Especially accidents happened in nuclear power stations and impossible solution their hazardous damages are imminent. In transportation of fossil fuels in tankers sailing in world oceans or seas sometimes leads to the oil spill at the result of wrecks. After this great ecological problems appear which can't be handled in time or prevented. Today's energy sector was based on traditional fossil fuels and partially bio-energy sources. But their extraction, transportation, saving generally takes much more expenditure, besides traditional fossil fuels usage causes redundant consumption and ecological issues having expensive solution.

5. Investigation Experimental Advantage: I should notice that the renewable energy potentials of the Republic is being realized by us, now. Up today this kind of research or calculation works haven't been done. Because this energy sector development is just beginner in the country. Therefore the fundamental investigations in this direction have to be realized before establishing renewable energy sector as the branch of the whole energy industry of the Republic. To my mind new and wide rang State programs and decrees are to be presented for developing and building this field effectively. For the protection of the woodlands and soils under forests this energy sector is to be improved initially in the regions of the country certainly. The major square of the forests should be taken into consideration lying in various zones of Azerbaijan. I hope the research carried out in Pirgulu State Nature Preserve may be the impulse doing next deeds in this field. Finally by mathematical and statistical calculation percentage for three renewable energy potentials in supplying general heating demand has been defined separately.

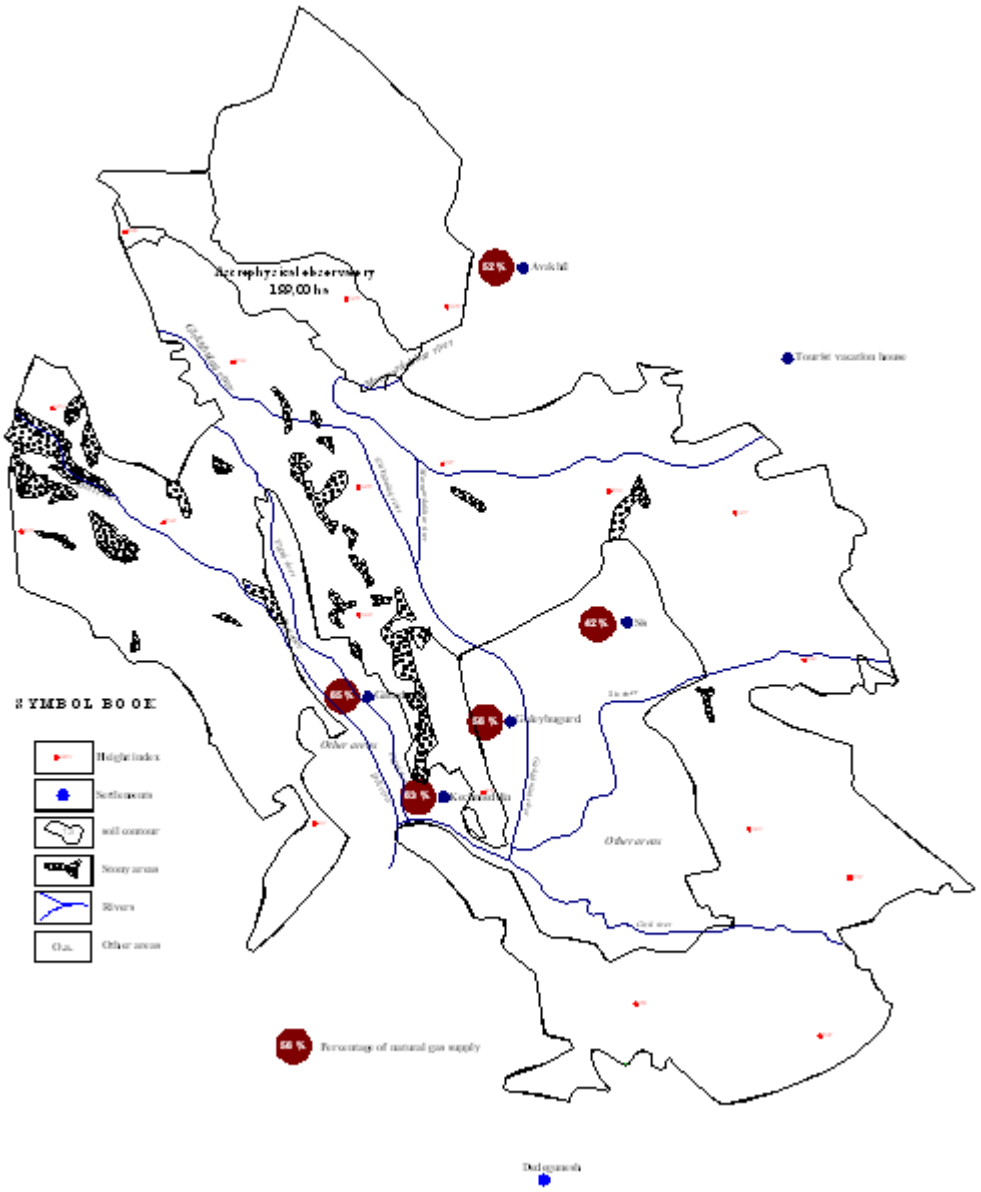

Figure 1. Biomass Energy Potential in Pirgulu State Nature Preserve

Table 1. Demand supply on Biomass, Solar and wind energy potentials

Biomass potential (kg) and biogas production (m^3)			
Mountainous belt (m), 1000-2200	*Annual index of biomass, kg*	*Average monthly biogas, m^3*	Demand supply, with %
	44415	159,8	35,08
Solar energy potential W/m^2			
Mountainous belt (m), 1000-2200	*Annual*		Demand supply, with %
	110,7		24,6
Wind energy potential m/sec			
Mountainous belt (m), 1000-2500	*Annual*		Demand supply, with %
	11,5		22,1

3. Conclusions

Before applying as a rule all three energy potentials have been determined of the region sounding the State Nature Preserve. Then technical and energy parameters were developed for CSWBEP before construction and building. In four seasons experiments in this plant have been carried by heating the experimental house and supplying hot water to this house where lives a family with 6 members. The final indexes on the warm and cold seasons of the experiments were compared and I've come to the conclusion that in all seasons the local renewable energy potentials can give opportunity the CSWBEP to work and supply heating demand. Of course while building the houses their energy provision

and heating storage capacity should be perfect. Heat losses begin initially from building construction.

After the test application and at the same time after the measurements done for determining local renewable energy reserves, the results show that prevention of forests' cutting is possible. So as the alternative of the forest wood in Pirgulu zone solar, wind, biomass energy potentials give opportunity CSWBEP to work effectively. At the same time this serves protection the woodlands of the region and makes the additional expenditures unnecessary being spent to the new energy pipelines. In the region average annual heat demand may be supplied by 35,08% biogas, 24,6% solar energy, 22,1% wind energy. So generally renewable energy reserves can provide 81,78 % of the general energy demand.

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