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**Group of Experts on Renewable Energy****United Nations Economic Commission for Europe Renewable Energy Status Report - Key messages and progress****Note by the secretariat***Summary*

At its twenty-third session, the Committee on Sustainable Energy invited the secretariat to prepare a Renewable Energy Status Report for the United Nations Economic for Europe (ECE) Region in collaboration with key partners as a tool for tracking the uptake of renewable energy in the region. In response, a report is under preparation with partners and is planned to be issued in December 2015.

This document provides an overview of the process and key findings from the work done to date and is presented to the Committee on Sustainable Energy for information.

Preliminary results confirm that the region is highly promising for the deployment of any kind of renewable energy technology. The region is well developed in terms of drafting and adopting strategic planning documents related to renewable energy although considerable improvements of the legal and regulatory framework are still awaited in member States that are less advanced in terms of renewable energy uptake. Most ECE countries have policies or targets in place for renewable energy.

## I. Introduction

1. Renewable energy data for many countries exist and is being collected by renowned international organisations collectively, including the International Energy Agency (IEA), the International Renewable Energy Agency (IRENA) and the Renewable Energy Policy Network for the 21st Century (REN21). However, data for several member States of the United Nations Economic Commission for Europe (ECE), particularly countries of Eastern Europe, Central Asia and the Caucasus, are not readily available, up-to-date, accessible or reliable. This is an obstacle for strategic energy planning in many of these countries and represents real value added for the ECE Group of Experts on Renewable Energy within the approved work plan of activities.

2. Recognising this, the Committee on Sustainable Energy, during its twenty-third session, invited the secretariat to prepare a Renewable Energy Status Report for the ECE Region (the Status Report) in collaboration with key partners as a tool for tracking the uptake of renewable energy in the region. In response, the Status Report is in preparation in cooperation with REN21 and IEA, to be launched in December 2015.

3. This activity has been conceived to fill data gaps, starting with the following 17 countries: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Montenegro, the Russian Federation, Serbia, Tajikistan, the former Yugoslav Republic of Macedonia, Turkmenistan, Ukraine and Uzbekistan. The focus on the selected countries constitutes a first part of an investigation on the status of the region - a wider scope of countries in the ECE region could be considered by the Group of Experts on Renewable Energy and eventually envisioned in a future exercise with additional resources, if requested and supported by ECE member States.

4. In the short-term, the project will allow establishing a baseline of the renewable energy status in the ECE region. It will allow monitoring and reporting on key renewable energy production and consumption variables and patterns in all economic sectors to support long-term planning for national energy options to increase the share of renewables in the global energy mix and to provide access to affordable and clean energy to all.

5. Over the long-term, updates of the report will allow tracking progress in attaining the objectives. Efforts during 2015 are to be seen as the foundation for a more systematic approach to improve the understanding of developments in the ECE region, including access to data, enhancement of network exchanges and capacity building on best-practice policies.

6. The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety provided funding directly to the German Agency for International Cooperation (GIZ) and to REN21.

7. After an introduction (I), this document provides an overview over the process and data collection (II), the structure of the Status Report (III), key findings and messages that can be drawn at this stage from the project (IV), and alludes to the implications for access to energy in the region (V). Chapter (VI) considers potential outreach activities and next steps. The document is presented to the Committee on Sustainable Energy for information.

## II. Building on an existing process

8. REN21, IEA and IRENA already have a renowned on-going and public data collection process in place that culminates in an annual publication of a Global Renewable Energy Status Report. Regional status reports have so far been published for China, India, the Middle East and North Africa (MENA), and the Economic Community of West African

States (ECOWAS) with respective partner organisations. These reports are available online<sup>1</sup>. It is a process that is carefully vetted to ensure high quality and unique reports about the uptake of renewable energy globally and regionally<sup>2</sup>.

9. For the production of the ECE Status Report on Renewable Energy ECE's partnership with IEA and REN21 has allowed to complement and strengthen existing efforts instead of launching a parallel process. ECE and its member States assisted to fill data gaps with information that is comprehensive, transparent, homogeneous and consistent, in order to generate and reinforce the capacity of the region for more accurate data gathering and processing. Based on experience with the other regional reports, REN21 and ECE have coordinated report production.

10. The report is based on formal and informal data provided by contributors and reviewers from governments, international/regional organisations, private sector, non-governmental organizations (NGOs), research and academia complemented by desk research. Peer review comments are being gathered in two stages by the REN21 Secretariat. Firstly, through an Expert Review Board and secondly, through an open online peer review process that makes use of REN21's extensive contributors and reviewer network. Data collection, draft of the report, review and feedback from Executive Review Board is ongoing at the preparation of this document.

11. The final report will be available in electronic format in December 2015 at:

<http://www.unece.org/energy/se/gere.html> and <http://www.ren21.net/status-of-renewables/regional-status-reports/>.<sup>3</sup>

### III. United Nations Economic Commission for Europe Renewable Energy Status Report

12. Describing the current status of renewable energy in all sectors, the report aims to:

- (a) Capture the current status of the renewable energy markets, investments in distributed and on-grids solutions, tracking of non-connected communities as well as examine the policy trends and regulatory frameworks in the selected countries;
- (b) Explore the latest market developments and activities undertaken in the ECE countries to accelerate the diffusion of renewables locally and regionally, and promote foreign investments;
- (c) Discuss regional, national and local opportunities in manufacturing, infrastructure, guidance of knowledge and resource mobilisation;
- (d) Understand the current status of energy efficiency approaches in the selected countries; and

<sup>1</sup> <http://www.ren21.net/status-of-renewables/global-status-report/>.

<sup>2</sup> <http://www.ren21.net/status-of-renewables/ren21-interactive-map/>

<sup>3</sup> The designations employed and the presentations of the material in this paper do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This paper has been issued without formal editing. Mention of firm names and commercial products does not imply the endorsement of the United Nations.

- (e) Quantify emission reductions from energy efficiency and renewable energy efforts in the selected countries.

13. It thus represents a comprehensive overview of the renewable energy infrastructure, industry, policy, regulations, market development and potential growth rates in the considered countries.

14. The Status Report mainly explores existing data on renewable energy and examines country case studies. Expert interviews were also conducted in order to present a comprehensive overview of renewable energy trends in the 17 aforementioned countries. These countries cover the following three regions that show significant data gaps: South East Europe, the Caucasus and Central Asia<sup>4</sup>.

15. The main challenge in assessing the baseline situation for renewable energy in the ECE region is the availability of the right information. Inadequate state of legal and regulatory framework in a country is typically ranked highest on the list of possible challenges for Renewable Energy investment, before e.g. availability of financing schemes, political risk and similar. In the report prepared for the first session of Group of Experts on Renewable Energy 18–19 November 2014, while cross-referencing data sources in preparation for this report, inconsistencies between databases were found. Data gaps were also identified, in which key renewable energy indicators for several ECE member States are missing.

16. Several ECE countries provided data to the REN21 process including Armenia, Azerbaijan, Georgia, Kazakhstan, Montenegro, the Russian Federation and Ukraine. For the remaining countries, data was collected through local stakeholders and experts associated with the Interstate Oil and Gas Transportation to Europe (INOGATE) Secretariat (for countries of Eastern Europe, Caucasus and Central Asia) and the Energy Community Secretariat (for countries of South-East Europe).

17. The availability and exchange of information through the Global Renewable Energy Status Report contributes to enabling an environment suitable for investments in close cooperation with key stakeholders and international partners, and through a strategic coordination with other ECE energy areas, in particular those related to fossil fuels.

#### **IV. Key findings and messages**

18. The 17 countries covered in the Status Report are very diverse in terms of their population size, size of the territory, economic, social and political characteristics. However, their energy systems were developed in a similar centralized fashion until the 1990s. Several countries covered by the Status Report are rich in fossil energy resources, including oil, gas, and coal, and 5 countries are net exporters of oil and gas (Azerbaijan, Kazakhstan, the Russian Federation, Turkmenistan and Uzbekistan). Most of the countries have sizeable hydropower and other renewable energy sources potential, including solar, wind and bioenergy, yet they are all at early stages of non-hydro renewable energy and energy efficiency deployment.

19. The selected countries are facing a number of challenges, which could become drivers for renewable energy and energy efficiency deployment. Energy security challenges

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<sup>4</sup> For the purpose of the analysis, the report refers to 2 regions: South-East Europe (Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro and Serbia) and Eastern Europe, Caucasus and Central Asia (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine, Uzbekistan) and the Russian Federation separately.

of the considered countries are key, especially in countries that are net energy importers. Power outages are an issue in some countries on seasonal basis. Electricity generation, transmission and distribution infrastructure is aging, as is district heating infrastructure, resulting in significant inefficiencies. Energy subsidies, prevalent in oil and gas exporting countries but still present also in importing countries, are detrimental to renewable energy and energy efficiency deployment as energy commodities are not priced at market prices, making renewable energy and energy efficiency comparatively very expensive. Energy intensity remains high despite notable improvements over the past two decades, both thanks to structural changes in economies and energy efficiency efforts, but further significant potential for energy efficiency remains to be exploited. Energy market structure is an issue in certain countries. Lack of liberalisation makes market entry for new players (in renewable energy or others) extremely difficult. Administrative red tape is also slowing down projects implementation across the considered countries.

20. Regional collaboration is driven by several initiatives. South-East European countries, as well as Moldova and Ukraine, are members of the Energy Community, Georgia is a candidate and Armenia is an observer. All countries have a commitment to the Energy Charter Treaty (all are members, but Serbia and Montenegro are only observers. Belarus has accepted provisional application of the Treaty and the Russian Federation applied the Treaty till 2009 but did not ratify it). The countries of Eastern Europe, the Caucasus and Central Asia are cooperating through the INOGATE programme with the European Union (EU). Energy Community, Energy Charter and INOGATE programmes are all to a different degree helping to implement or requiring its members to enforce EU regulations, including those on renewable energy and energy efficiency, providing legal framework conducive to renewable energy and energy efficiency deployment. Regional cooperation is also driven through cross-regional power trade. Transmission investment is supportive and a pre-requisite for increased integration of renewable power in the networks. The Central Asia South Asia Electricity Transmission and Trade project (CASA-1000) represents a flagship project implemented jointly by Tajikistan, Kyrgyzstan, Afghanistan and Pakistan and co-financed by the World Bank and EBRD in particular. The 17 countries are in different stages of their implementation of these regulations. Moreover, all countries with the exception of the Russian Federation, Uzbekistan and Turkmenistan have at least one city or town participating as a signatory in the Covenant of Mayors. This translates into city's commitment to meet and exceed the EU's 20% CO<sub>2</sub> reduction objective. Overall, while there are several initiatives with regional dimension, common objectives or regional targets have not yet been formulated at regional level.

21. The selected countries differ widely in their share of renewable energy in the total final energy consumption and in some countries the numbers are driven by the persisting traditional uses of biomass heating, while other countries have high shares of hydropower in their power sectors. Countries with high shares of renewable energy in total final energy consumption include Tajikistan (58%, hydropower, based on 2012 data), Montenegro (46%, traditional biomass uses and hydropower), Albania (38%, mostly hydropower but also some traditional biomass uses), Georgia (28%, mostly hydropower but also some traditional biomass uses), and Kyrgyzstan (22%, hydropower).<sup>5</sup>

22. The share of renewable energy sources in power generation in the considered countries differs widely from country to country. Hydropower is the backbone of electricity systems of several focus countries. Albania, Kyrgyzstan and Tajikistan run their power

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<sup>5</sup> World Bank and IEA, 2015. Progress Towards Sustainable Energy 2015, Summary Report, <http://trackingenergy4all.worldbank.org/~media/GIAWB/GTF/Documents/GTF-2015-Summary-Report.ashx>.

systems almost exclusively on hydropower, while in Georgia and Montenegro hydropower represents more than half of electricity produced in the country. However, the Russian Federation has the largest total hydropower production among the considered countries but its share in the total power generation is lower, due to the size of Russia's power system. Other renewable energy technologies for power generation are nascent in the selected countries, with significant deployment only in Ukraine (mostly solar photovoltaic – PV - and onshore wind). Smaller developments have happened in Azerbaijan, Kazakhstan, the former Yugoslav Republic of Macedonia, Montenegro and Serbia (mostly onshore wind, solar PV and biogas/biomass installations). While rural electrification is not a burning issue for the considered countries, distributed renewable energy solutions like solar PV, small scale wind, biomass and micro-hydro can be interesting solutions for remote electricity generation and in places with power outages or unstable power.

23. The selected countries possess potential to develop further its renewable energy sources beyond hydropower. There is sizable solar PV potential in all countries, and insolation is particularly strong in South-East Europe, Caucasus, Central Asia and southern regions of the Russian Federation, improving economics of the potential solar PV generation in these countries<sup>6</sup>. Onshore wind resources are also present in the whole the considered countries, with particularly large resources in Ukraine, Kazakhstan and the Russian Federation<sup>7</sup>. South-East Europe, Eastern Europe as well as the Russian Federation have large biomass resources, which are only partially exploited<sup>8</sup>. Concentrating solar power (CSP) potential exists only in the Central Asia region and particular locations of the Russian Federation, while confirmed high-temperature geothermal resources suitable for power generation are present only in a few sites in the Russian Federation<sup>9</sup>. Other countries may have modest geothermal resources but their suitability for power generation needs to be confirmed.

24. Penetration of modern renewable energy technologies for heating and cooling in the considered countries is modest. Solar Water Heating installations exist in a few countries (Albania, Armenia, the former Yugoslav Republic of Macedonia, the Russian Federation and Ukraine) and could be economically developed in all considered countries. Potential for bioenergy-based renewable energy heat in the countries selected is great. In selected places with district heating networks these could be converted to be fuelled by solid biomass or biogas. (e.g. World Bank financed Biomass District Heating Project for Belarus with the objective to scale up the efficient use of renewable biomass in heat and electricity generation in selected towns in Belarus).

25. Despite biofuels mandates in several countries and ample bioenergy potential, capacities for production of liquid biofuels can only be found in Belarus (biodiesel), the former Yugoslav Republic of Macedonia (biodiesel), and Ukraine (bioethanol).

26. A more detailed overview of energy efficiency status in the considered countries is challenged by lack of detailed statistics for sectoral final energy uses. Examination of

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<sup>6</sup> Statement based on Country Profiles published in the following sources: International Renewable Energy Agency (IRENA), "Renewable Energy Country Profiles for the European Union". Abu Dhabi, June 2013, <http://www.irena.org/DocumentDownloads/Publications/EU27Complete.pdf>, viewed 25 July 2015; IRENA, "Renewable Energy Country Profiles: Eurasia, Non-EU Europe and North America" (Abu Dhabi: IRENA, December 2013).

<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> IEA, "Solar Energy Perspectives". (Paris: OECD/IEA, 2011), page 58, [http://www.iea.org/publications/freepublications/publication/Solar\\_Energy\\_Perspectives2011.pdf](http://www.iea.org/publications/freepublications/publication/Solar_Energy_Perspectives2011.pdf), viewed July 24 2015; WEC, op. cit. note 5, page 402.

energy intensity (which cannot be used as a replacement of energy efficiency indicators) shows that the countries made significant progress since 1990<sup>10</sup> but energy intensity is not decreasing anymore<sup>11</sup>. Most of the countries still have high levels of losses in their electricity, natural gas or district heating transmission and distribution networks<sup>12</sup>. Barriers to a more systematic market development for energy efficiency, such as lacking or inadequate institutional frameworks, remain. For example, Kyrgyzstan and Turkmenistan, with high energy intensities, do not have governmental institutions to formulate and implement energy efficiency strategies and policies.

27. The building sector has a considerable potential in the countries covered by the Status Report. In South East Europe (SEE) countries, buildings represent 50% of final energy consumption<sup>13</sup> and the potential for savings is estimated between 20 and 40% of buildings energy use<sup>14</sup>. In countries of Eastern Europe, the Caucasus and Central Asia, for example, Armenia's National Programme on Energy Saving and Renewable Energy estimates 40 % potential for energy savings in its building sector. In the Russian Federation, deep retrofits in residential buildings could result in 50% savings.<sup>15</sup> Retrofitting existing buildings has been pursued through number of programmes addressing residential and public buildings with financing from international donors (e.g. a credit of \$32 million in Bosnia and Herzegovina dedicated to demonstrating the benefits of energy efficiency improvements in public sector buildings by the International Development Association). Given the importance of thermal use in buildings and wide-spread use of poorly-maintained and therefore inefficient district heating systems in the considered countries, this area holds high energy savings potential<sup>16</sup>.

28. Efficient lighting, appliances and cooking could further contribute to improving energy efficiency in buildings, but policy advancements are slow. For example, Kyrgyzstan has identified energy efficiency labelling as one of its priority actions, but no action has been carried out. Ukraine, on the other hand, provides partial reimbursement of loans for residential energy efficiency equipment under the State Target Economic Programme on energy efficiency. Outside South east Europe, only Kazakhstan, and Russian Federation and Tajikistan have already phased out inefficient incandescent lamps from their markets. For other sectors, initiatives to improve energy efficiency are less common in industry and transport sectors, partly due to less developed policy and regulatory instruments.

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<sup>10</sup> Caterina Ruggeri Laderchi, Anne Olivier, and Chris Trimble. 2013. *Balancing Act: Cutting Energy Subsidies While Protecting Affordability*. Washington, DC: World Bank. doi: 10.1596/978-0-8213-9803-6 License: Creative Commons Attribution CC BY 3.0 and IEA, Eastern Europe, Caucasus and Central Asia, 2015. [http://www.iea.org/bookshop/705-Eastern Europe, Caucasus and Central Asia](http://www.iea.org/bookshop/705-Eastern%20Europe,%20Caucasus%20and%20Central%20Asia).

<sup>11</sup> IEA. *Enabling Renewable Energy and Energy Efficiency Technologies*, 2015. <https://www.iea.org/publications/insights/insightpublications/EnablingRenewableEnergyandEnergyEfficiencyTechnologies.pdf>

<sup>12</sup> Only Kazakhstan, the Russian Federation and Uzbekistan had electric power transmission and distribution losses as a percentage of below 10% based on the World Bank Indicators Database. Uzbekistan's indicator has remained unchanged over the past decade.

<sup>13</sup> Energy Community Secretariat, *Energy Community: Taping on its Energy Efficiency Potential*, 2015. <https://www.energycommunity.org/portal/page/portal/18B2AB6BA84663F2E053C92FA8C064DA>

<sup>14</sup> Ibid.

<sup>15</sup> IEA, Russia, 2014. [https://www.iea.org/bookshop/474-Russia\\_2014](https://www.iea.org/bookshop/474-Russia_2014)

<sup>16</sup> IEA, Eastern Europe, Caucasus and Central Asia, 2015. [http://www.iea.org/bookshop/705-Eastern Europe, Caucasus and Central Asia](http://www.iea.org/bookshop/705-Eastern%20Europe,%20Caucasus%20and%20Central%20Asia).

29. Policies and targets constitute essential drivers for deployment of secondary regulation and attracting investment to projects in renewable energy and energy efficiency. The Status Report highlights some positive progress made in countries of South East Europe, Eastern Europe, the Caucasus and Central Asia as well as in the Russian Federation. Yet, there is still significant room for improvement of policies and regulations in these countries to fully unleash the available potential of renewable energy and energy efficiency.

30. All 17 countries have embarked on the promotion of renewable energy. Part of this effort is the adoption of targets and regulatory policies for renewable energy deployment. All countries have renewable energy targets. There are 2 countries that have few support policies for renewable energy, Turkmenistan and Uzbekistan. The most common way to support renewable energy in power generation is through feed-in tariffs, present in all countries except for Azerbaijan, Moldova, Tajikistan, Turkmenistan and Uzbekistan. Tendering is used in Albania, Bosnia and Herzegovina, Montenegro and the Russian Federation. Tradable renewable energy certificates are used in Belarus and the Russian Federation. Renewable heating and cooling is supported through mandates only in Montenegro<sup>17</sup>. Biofuels obligations and mandates are present only in 4 countries: Albania, Belarus, Montenegro, and Ukraine. There are various types of fiscal incentives and public financing present in the considered countries with the exception of five countries (Kazakhstan, The Former Yugoslav Republic of Macedonia, Serbia, Turkmenistan, and Uzbekistan). Public investment, loans or grants are used in Armenia, Azerbaijan, Georgia, Kyrgyzstan, Moldova, Montenegro and Tajikistan.

31. In terms of energy efficiency targets and policies, all investigated countries are pursuing some type of regulatory mechanism, be it directly or through residential building initiatives. All countries except for Armenia, Azerbaijan, Georgia, Kyrgyzstan and Turkmenistan have established mandatory targets. There are 4 countries that don't have any national energy efficiency awareness campaigns. Regulatory policies are spread the most in building sector, followed by lighting and appliances, transport and industry. Building standards exist in all but 2 countries. Mandatory labelling for buildings is in place only in South-East Europe, except Albania. Lighting standards exist in 9 countries of SEE and EECCA. Mandatory labelling for lighting is in place in 6 countries. Mandatory labelling for appliances exists in 8 countries. In the transport sector, several countries have vehicle fuel economy and emission standards. For example, Azerbaijan has put in place strict fuel efficiency standards prohibiting use of old, inefficient vehicles.<sup>18</sup> Albania, Belarus, BiH, the former Yugoslav Republic of Macedonia, Montenegro and Serbia use energy efficiency targets for industry. The industry sector is addressed actively in Belarus and Kazakhstan with high share of industry in final energy consumption. Other instruments used in the considered countries for industry are auditing and monitoring regulations. Energy efficiency in power generation is addressed in policies of 12 countries.

32. Looking into the near future, expected renewable energy developments in the considered countries are relatively modest and differ by sub-regions:

(a) Southern Europe is expected to be the most active as a region, due to proximity to the EU, with its industry, installers, developers and EU energy market that is converging. Developments are expected especially in solar PV, solar water heating, onshore wind and bioenergy technologies. The gradual switch from traditional uses of

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<sup>17</sup> Some countries are working on introducing measures such as Albania where a draft Government Decree on mandatory installation of solar water heater systems planned.

<sup>18</sup> IEA, Eastern Europe, Caucasus and Central Asia, 2015. [http://www.iea.org/bookshop/705-Eastern\\_Europe,\\_Caucasus\\_and\\_Central\\_Asia](http://www.iea.org/bookshop/705-Eastern_Europe,_Caucasus_and_Central_Asia)



biomass to modern uses would be beneficial for the environment of the region and health of its inhabitants;

(b) In Eastern Europe, the most active player to date, Ukraine, is facing a complex geopolitical situation and a severe devaluation of its currency, posing major obstacles to further development of renewable energy, in particular solar PV and wind;

(c) In Central Asia, Kazakhstan is expected to be the biggest renewable energy player. The country has a substantial wind potential and has made first steps towards its deployment. Uzbekistan is also launching expansion of solar capacity with the support of the Asian Development Bank (ADB);

(d) Caucasus deployment could be driven by energy security concerns in Armenia and Georgia. Armenia is more advanced, but still only in the preparatory stages of its renewable energy deployment, but the government has recently developed a Renewable Energy Programme Investment Plan;

(e) In the Russian Federation, due to its large size, some renewable energy development can be expected but it will be far lower than the potential the country has. Most of the power sector is still in the hands of state, making entry for renewable energy actors difficult. The only pressure for new development could come from system adequacy concerns over time, due to the aging power system where significant capacities will have to be decommissioned over the next decade. However, the competition with new gas-based power plants will be fierce.

33. Further development of energy efficiency in the near future, despite its large potential in the considered countries, is expected to be hampered by slow policy development and complexities of its enforcement. Lack of detailed sectoral statistical data is detrimental to the implementation of proper monitoring:

(a) In South East Europe, countries like Montenegro, the former Yugoslav Republic of Macedonia and Albania have a relatively more developed policy framework in place, which should enable increase in energy efficiency in the near future. The size of the energy efficiency market throughout in South-East Europe will be determined by market players' ability to implement projects driven by newly introduced policy frameworks and to leverage available financing facilities<sup>19</sup>.

(b) In Eastern Europe, the Caucasus and Central Asia, countries like Belarus, Kazakhstan, Moldova, Tajikistan and Uzbekistan have the main pillars of energy efficiency framework in place, and these could yield benefit in the medium-term provided their enforcement is properly supported. Countries with energy intensity above the other countries' average and none or limited policies in place risk falling behind as competitiveness of their economies could be hampered by low energy efficiency. In Ukraine, in particular, lack of efficiency measures in industry sector could be of concern combined with the challenging economic and geopolitical situation. Phasing out of energy subsidies and introduction of metering in district heating in particular at final user level will be essential for future growth of energy efficiency markets in these countries.

(c) In the Russian Federation, a wide-ranging framework to promote energy efficiency across several sectors is being created. Yet, adequate regulatory conditions for

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<sup>19</sup> In 2015, only one third of the 700 million euro available for Western Balkans from international financial institutions were being used based on the Energy Community Secretariat, Energy Community: Taping on its Energy Efficiency Potential, 2015. <https://www.energy-community.org/portal/page/portal/18B2AB6BA84663F2E053C92FA8C064DA>

investment projects to take place at the desired scale are not met and delay further improvements in energy efficiency of buildings and industries.

34. In conclusion, while governments are clearly making initial efforts to build a basis or advance policy and regulatory frameworks for renewable energy and energy efficiency, the unfavourable economics of energy supply and use, due to subsidies and abundance of fossil fuels in some countries, continue to hamper economics of projects. Market structure plays an important role in the deployment of for renewable energy and energy efficiency and market entry for new players remains challenging in countries that did not fully liberalise their energy markets. Upgrades of aging energy infrastructure could be an opportunity to better integrate renewable energy and improve energy efficiency. Common regional objectives for renewable energy and energy efficiency could help to advance this agenda and pull the 17 countries more intensively into ongoing international coordination.

35. Taking advantage of the findings of the Status Report, ECE work on sustainable energy will greatly benefit from the increased knowledge on how to further improve access to affordable and clean energy for all and help reduce greenhouse gas emissions and the carbon footprint of the energy sector in the considered countries. The involved Group of Experts on Renewable Energy was established by ECE to carry out action-oriented, practical activities on renewable energy in line with the Secretary General's SE4All initiative.

## **V. Communities with no access to energy in the United Nations Economic Commission for Europe region**

36. The expanding role of renewables is also an efficient way to provide access to energy in areas without access to modern energy services. This activity has allowed complementing the work carried out previously and presented to the Committee on Sustainable Energy at its twenty-third session in November 2014: ECE/ENERGY/GE.7/2014/2– Report of the Group of Experts on Renewable Energy in its first session. Gathering new data and information on the communities with no access to energy was possible through responses to the questionnaire used for this report.

37. The Status Report has collected qualitative information to measure the different stages in the energy access developments of ECE countries. It confirmed that all 17 countries have electrification rates of 100 per cent of their population. This is a notable improvement on the situation of 1990 when 12 countries reported electricity access rates between 90 and 100 per cent. At the same time, some remote settlements and rural communities are reported to lack access to electricity. The reasons vary per country and include history of conflict or changes in sources of electricity supply:

(a) In Bosnia and Herzegovina, villages lack access to electricity since physical damages caused by the conflict in the 1990s. United Nations Development Programme (UNDP) implemented projects in the country that brought electricity to over 400 families, with close to 100km of low and high voltage electricity grid rehabilitated in 17 municipalities. Renewable energy solutions are also encouraged as illustrated in the case of renewable challenge competition;

(b) In Georgia, electrification works are underway in 8 remaining villages without access to electricity. Georgia launched programme for rural electrification in 2012 to address the needs of 36 off-grid villages in regions of Adjara, Imereti, Javakheti, Kakheti, Kvemo Kartli, Kvemo Svaneti, Mtkheta Mtianeti, Racha-lechkhumi, Samtskhe and Shida Kartli. USAID provided the initial financing for electrification works in 2012 and government has been providing a budget allocation since 2013;

(c) In Kyrgyzstan, about 20 settlements are not provided with electricity in Batken region on the border with Uzbekistan and Tajikistan. Electricity was traditionally supplied from power plant located outside of Kyrgyzstan but supplies were ceased in 2013. The Islamic Development Bank has recently provided financing support for a project that will improve electricity supply situation in the region;

(d) Uzbekistan has about 1500 communities without connection to centralised electricity supply. The issue is pressing in the Republic of Karakalpaksta where UNDP provided 25 solar PV systems already during the period of 2002–2006;

(e) Tajikistan's electricity company Barki Tojik reports that electricity grid covers 96% of the country, except for remote, sparsely populated, mountainous regions of the country. The issue is access to reliable supply of electricity. The country lacks power generation capacity to satisfy its electricity demand. The situation is managed through scheduled outages. In the winter, 70% of the population living in rural areas has about 3 hours of electricity supply per day. Rural residents consume only 8.9% of the total volume of electricity in Tajikistan.

38. Outages, caused by the lack of reliability of power supply, continue to occur in several countries, especially in Caucasus and Central Asia with poorly maintained and aging energy infrastructure<sup>20</sup>. Based on a World Bank enterprise survey<sup>21</sup>, this is not only issue for rural household but also for businesses. Outages are affecting companies' sales particularly in Tajikistan (4.4% of sales lost due to electrical power outages), Kyrgyzstan (2.3%) and Uzbekistan (2.2%), while the Organisation for Economic Co-operation and Development (OECD) average is 0.1%. In Tajikistan where the issue is the most aggravated, the power shortages are estimated at about a quarter of winter electricity demand (2,700 GWh) and impose economic losses estimated at over US\$200 million per annum or 3 percent of GDP.

39. Access to non-solid fuels for heating and cooking purposes remains a pressing issue in the considered countries. From the 17 countries covered by the Status Report, at least 11 countries have more than 5% of its population using solid fuels for cooking and heating<sup>22</sup>, with consequent health and environmental effects. In 7 countries this share is more than 30% (in Albania 38% of its population doesn't have access to non-solid fuels, in Bosnia and Herzegovina 58%, the former Yugoslav Republic of Macedonia 33%, Georgia 46%, Montenegro 38%, Serbia 31% and Tajikistan 31%).

40. In the ECE region, according to the database of the Global Tracking Framework (GTF), which is the main tool for the SE4ALL initiative to chart the course to achieve universal energy access, double the use of renewable energy and improve energy efficiency, all ECE Member States have full access to electricity. In the absence of a universally agreed-upon definition, the GTF based its analysis on the common definition of access to energy services characterized by the following components: (i) the availability of an electricity connection, and (ii) the use of non-solid fuels as the primary energy source for cooking/lighting.

<sup>20</sup> IEA, Eastern Europe, Caucasus and Central Asia, 2015. [http://www.iea.org/bookshop/705-Eastern Europe, Caucasus and Central Asia](http://www.iea.org/bookshop/705-Eastern%20Europe,%20Caucasus%20and%20Central%20Asia).

<sup>21</sup> World Bank, 2015. Losses due to electrical outage (% of annual sales), year 2013. <http://data.worldbank.org/indicator>.

<sup>22</sup> World Bank and IEA, 2015. Progress Towards Sustainable Energy 2015, Summary Report, <http://trackingenergy4all.worldbank.org/~/-/media/GIAWB/GTF/Documents/GTF-2015-Summary-Report.ashx>.

41. The two-fold metrics is sufficient to assess the physical access to modern energy service but is not capturing the multidimensional aspects of energy services such as the reliability of power supplied, the affordability of the services, the availability of alternative energy providers – rather conventional or renewable – in other words the quality of energy services. These components are essential to effectively provide access to electricity grids.

## **VI. Outreach activities**

42. Outreach and discussions in the selected countries are an integral part of the publication of the Status Report. It is planned to launch the Status Report at the twenty-first Conference of Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris, followed by outreach events based on key findings and recommendations from the Status Report as well as web-based activities in close cooperation between ECE and REN21.

43. ECE member States are invited to host events with national key stakeholders on how to increase the uptake of renewable energy presenting and using key findings and messages from the Status Report. If requested by member States, the Committee on Sustainable Energy, the Group of Experts on Renewable Energy, its Bureau, the ECE secretariat and REN21 will continue to collaborate in 2016 to deepen the understanding on renewable energy update, data quality and information to progress towards a better understanding on how to effectively and efficiency integrate renewable energy into future sustainable energy systems.

## Annexes

### Annex I

#### Overview of renewable energy and energy efficiency policies status

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##### *Renewable Energy Status: Country Overview*

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	Policy	No policy
<b>Target</b>	Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Kazakhstan, Kyrgyzstan, Moldova, Montenegro, the Russian Federation, Serbia, Tajikistan, the FYR of Macedonia, Ukraine	Uzbekistan
<b>No target</b>	Georgia	Turkmenistan

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##### *Energy Efficiency Status: Country Overview*

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	Policy	No policy
<b>Target</b>	Albania, Belarus, Bosnia and Herzegovina, Kazakhstan, Moldova, Montenegro, the Russian Federation, Serbia, Tajikistan, the FYR of Macedonia, Ukraine, Uzbekistan	None
<b>No target</b>	Armenia, Azerbaijan, Kyrgyzstan	Georgia, Turkmenistan

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Source: Preliminary information from REN21/ECE Renewable energy Status Report information gathering, 2015.

## Annex II

## Energy Overview

<i>Country</i>	<i>Energy Imports, net (% of energy use) 2011</i>	<i>Energy Subsidies as % of GDP 2015</i>	<i>Energy use per capita (MJ/capita) 2011</i>	<i>Electrification rate (% of population) 2012</i>
Albania	34%	1,9%	32253	100%
Andorra				100%
Armenia	67%	4,3%	38362	100%
Austria	65%	0,9%	165409	100%
Azerbaijan	-377%	6,3%	57332	100%
Belarus	86%	7,0%	129695	100%
Belgium	70%	1,9%	224797	100%
Bosnia and Herzegovina	35%	37,0%	77268	100%
Bulgaria	36%	33,9%	109473	100%
Canada	-61%	2,5%	308426	100%
Croatia	55%	3,7%	82539	100%
Cyprus	96%	0,0%	88800	100%
Czech Republic	25%	8,4%	171775	100%
Denmark	-15%	1,6%	135179	100%
Estonia	10%	0,5%	177425	100%
Finland	51%	0,5%	270634	100%
France	46%	1,0%	161215	100%
Georgia	68%	5,2%	33099	100%
Germany	60%	1,4%	159145	100%
Greece	64%	2,6%	100669	100%
Hungary	57%	3,9%	104851	100%
Iceland	16%	0,5%	752135	100%
Ireland	87%	0,5%	120883	100%
Israel	80%	2,9%	124876	100%
Italy	81%	0,6%	118056	100%
Kazakhstan	-107%	11,0%	195565	100%
Kyrgyzstan	51%	26,4%	25133	100%
Latvia	51%	1,3%	86526	100%
Liechtenstein				100%

Lithuania	79%	4,4%	101006	100%
Luxembourg	97%	3,2%	336772	100%
Malta	100%	0,2%	83956	100%
Moldova	96%	5,6%	39088	100%
Monaco				100%
Montenegro	36%	16,7%	76013	100%
Netherlands	17%	1,1%	194174	100%
Norway	-597%	0,9%	236646	100%
Poland	32%	9,1%	111300	100%
Portugal	77%	1,0%	90550	100%
Romania	23%	6,5%	74371	100%
Russian Federation	-78%	16,0%	216281	100%
San Marino				100%
Serbia	31%	34,7%	93674	100%
Slovakia	63%	3,1%	134562	100%
Slovenia	48%	2,4%	148511	100%
Spain	75%	1,7%	112494	100%
Sweden	33%	0,3%	220839	100%
Switzerland	51%	0,2%	134269	100%
Tajikistan	30%	7,1%	11691	100%
The FYR of Macedonia	44%	18,7%	61833	100%
Turkey	71%	4,5%	64306	100%
Turkmenistan	-164%	23,2%	202591	100%
Ukraine	32%	60,7%	115929	100%
United Kingdom	31%	1,4%	123722	100%
United States of America	19%	3,8%	294298	100%
Uzbekistan	-21%	26,3%	67389	100%

Sources for this table are from the following: Energy imports from World Development Indicators, World Bank, <http://data.worldbank.org/data-catalog/world-development-indicators>, viewed on 10 August 2015; Energy subsidies from "Post-tax subsidies as a percent of GDP" based on Counting the Cost of Energy Subsidies, IMF Survey, 2015, <http://www.imf.org/external/pubs/ft/survey/so/2015/new070215a.htm>, viewed on 10 August 2015; energy use per capita from World Development Indicators, World Bank, <http://data.worldbank.org/data-catalog/world-development-indicators>, viewed on 10 August 2015 and electrification rate from World Bank and IEA, 2015. Progress Towards Sustainable Energy 2015, Summary Report, <http://trackingenergy4all.worldbank.org/~media/GIAWB/GTF/Documents/GTF-2015-Summary-Report.ashx>, viewed on 10 August 2015

## Annex III

### Energy access and energy poverty status in the considered countries

<i>Country</i>	<i>Access to non-solid fuel 2012</i>	<i>of which rural 2012</i>	<i>of which urban 2012</i>	<i>Energy Poverty Rate* 2012</i>	<i>Value lost due to electrical outages (% of sales) 2013**</i>
Albania	62%	42%	84%	46%	2.6%
Armenia	93%	95%	100%	35%	0.1%
Azerbaijan	93%	82%	100%	21%	0.1%
Belarus	100%	97%	100%	6%	0.1%
Bosnia and Herzegovina	42%	24%	69%	29%	0.3%
Georgia	54%	16%	87%	39%	0.5%
Kazakhstan	90%	80%	97%	27%	0.4%
Kyrgyzstan	na	na	na	25%	2.3%
Moldova	91%	86%	100%	52%	0.2%
Montenegro	62%	47%	84%	35%	0.8%
Russian Federation	99%	91%	99%	29%	0.2%
Serbia	69%	46%	87%	49%	0.3%
Tajikistan	69%	58%	95%	60%	4.4%
The fYR of Macedonia	67%	43%	84%	na	1.2%
Turkmenistan	100%	100%	100%	na	na
Ukraine	96%	89%	99%	15%	0.2%
Uzbekistan	88%	79%	100%	na	2.2%

\*Energy Poverty rate is the share of households spending more than 10 percent of their budgets on energy.

\*\*Data for Russian Federation from 2012

Sources:

1 Progress towards Sustainable Energy, Global Tracking Framework 2015, Summary, pg. 38, <https://trackingenergy4all.worldbank.org/reports>

2 Caterina Ruggeri Laderchi, Anne Oliver and Chris Trimble. 2013. Balancing Act: Cutting Energy Subsidies While Protecting Affordability. Washington, DC: World Bank.

3 World Development Indicators, World Bank, <https://data.worldbank.org/data-catalog/world-development-indicators>



## Annex IV

## Share of Renewable Energy in Total Primary Energy Supply

<i>Country</i>	<i>Total Energy TPES 2012 (ktoe)</i>	<i>Renewable Energy TPES 2012 (ktoe)</i>	<i>Non-Renewable Energy TPES 2012 (ktoe)</i>
Albania	2075	624	1451
Andorra	0	0	0
Armenia	2971	209	2762
Austria	33109	10795	22314
Azerbaijan	13692	255	13437
Belarus	30499	1617	28882
Belgium	55950	5801	50149
Bosnia and Herzegovina	6670	542	6128
Bulgaria	18345	1632	16713
Canada	251124	46129	204995
Croatia	7917	993	6924
Cyprus	2226	130	2096
Czech Republic	42647	3431	39216
Denmark	17342	4639	12703
Estonia	5521	861	4660
Finland	33304	10123	23181
France	252330	22347	229983
Georgia	3706	939	2767
Germany	312525	37091	275434
Greece	26553	2475	24078
Hungary	23469	1871	21598
Iceland	5695	5112	583
Ireland	13245	865	12380
Israel	24277	1172	23105
Italy	158800	21909	136891
Kazakhstan	74853	716	74137
Kyrgyzstan	4132	1223	2909
Latvia	4416	1707	2709

Liechtenstein	0	0	0
Lithuania	7376	1160	6216
Luxembourg	0	0	0
Malta	671	9	662
Moldova	3276	109	3167
Monaco	0	0	0
Montenegro	1062	308	754
Netherlands	78578	4184	74394
Norway	29195	14047	15148
Poland	97855	9228	88627
Portugal	21394	4630	16764
Romania	34920	5216	29704
Russian Federation	756593	22110	734483
San Marino	0	0	0
Serbia	14462	1827	12635
Slovakia	16650	1403	15247
Slovenia	6996	1072	5924
Spain	124968	16153	108815
Sweden	50162	19067	31095
Switzerland	25613	6092	19521
Tajikistan	2267	1453	814
The fYR of Macedonia	2968	291	2677
Turkey	116897	12187	104710
Turkmenistan	25570	-	25570
Ukraine	122661	2649	120012
United Kingdom	192231	9149	183082
United States of America	2140618	135885	2004733
Uzbekistan	48284	968	47316
Total	4232919,00	418565	3814354
% share		9,89	90,11

International Energy Agency (IEA) and World Bank, "Sustainable Energy for All 2015 – Progress Towards Sustainable Energy 2015". Washington DC, June 2015,  
<http://trackingenergy4all.worldbank.org/~media/GIAWB/GTF/Documents/GTF-2015-Summary-Report.pdf> , viewed 30 July 2015

## Annex V

## Level of Primary Energy Intensity (MJ/2011 USD PPP)

<i>Country</i>	<i>Level of Primary Energy Intensity, 1990</i>	<i>Level of Primary Energy Intensity, 2010</i>	<i>Level of Primary Energy Intensity, 2012</i>
Albania	7,7%	3,2%	3,0%
Andorra			
Armenia	24,4%	5,4%	5,7%
Austria	4,5%	4,1%	3,8%
Azerbaijan	15,6%	3,4%	3,9%
Belarus	23,1%	7,7%	8,0%
Belgium	6,7%	5,9%	5,3%
Bosnia and Herzegovina	47,3%	7,7%	7,9%
Bulgaria	13,9%	6,7%	6,7%
Canada	10,1%	7,6%	7,3%
Croatia	4,8%	4,1%	3,9%
Cyprus	4,3%	3,9%	3,6%
Czech Republic	10,9%	6,7%	6,4%
Denmark	4,3%	3,5%	3,1%
Estonia	19,9%	8,3%	7,2%
Finland	8,5%	7,6%	6,8%
France	5,5%	4,7%	4,5%
Georgia	13,5%	4,9%	5,2%
Germany	6,0%	4,2%	3,9%
Greece	4,3%	3,6%	4,0%
Hungary	6,8%	4,9%	4,5%
Iceland	11,7%	18,9%	19,3%
Ireland	5,6%	3,1%	2,8%
Israel	5,3%	4,3%	4,2%
Italy	3,6%	3,5%	3,3%
Kazakhstan	14,8%	9,0%	8,7%
Kyrgyzstan	20,5%	7,6%	10,7%
Latvia	9,1%	5,0%	4,3%

<i>Country</i>	<i>Level of Primary Energy Intensity, 1990</i>	<i>Level of Primary Energy Intensity, 2010</i>	<i>Level of Primary Energy Intensity, 2012</i>
Liechtenstein			
Lithuania	11,5%	4,6%	4,4%
Luxembourg	6,6%	3,9%	3,7%
Malta	4,8%	3,0%	2,3%
Moldova	17,5%	10,2%	9,3%
Monaco			
Montenegro		5,8%	5,2%
Netherlands	6,0%	4,9%	4,6%
Norway	4,8%	4,5%	3,9%
Poland	11,4%	5,3%	4,8%
Portugal	3,7%	3,6%	3,4%
Romania	10,0%	4,4%	4,2%
Russian Federation	12,8%	9,5%	9,5%
San Marino			
Serbia	7,7%	7,7%	7,1%
Slovakia	11,0%	5,7%	5,0%
Slovenia	6,5%	5,3%	5,2%
Spain	4,1%	3,6%	3,6%
Sweden	7,8%	5,6%	5,3%
Switzerland	3,4%	2,8%	2,6%
Tajikistan	11,5%	5,7%	5,1%
The fYR of Macedonia	5,1%	5,0%	5,1%
Turkey	3,8%	3,6%	3,6%
Turkmenistan	23,9%	18,8%	16,6%
Ukraine	19,3%	15,4%	13,5%
United Kingdom	6,3%	3,9%	3,6%
United States of America	8,7%	6,1%	5,6%
Uzbekistan	31,1%	15,1%	14,4%

International Energy Agency (IEA) and World Bank, “Sustainable Energy for All 2015 – Progress Towards Sustainable Energy 2015”. Washington DC, June 2015, <http://trackingenergy4all.worldbank.org/~media/GIAWB/GTF/Documents/GTF-2015-Summary-Report.pdf> , viewed 30 July 2015

## Annex VI

## General Overview

<i>Country</i>	<i>Population 2014</i>	<i>Population Density 2014</i>	<i>Urban Population as % of population 2014</i>	<i>GDP per capita (current US\$) 2014</i>
Albania	2.894.475	105,64	56,41%	4.619,21
Andorra	80.153	170,54	85,63%	
Armenia	2.983.990	104,81	62,81%	3.646,66
Austria	8.534.492	103,56	65,92%	51.127,08
Azerbaijan	9.537.823	115,39	54,36%	7.884,19
Belarus	9.470.000	46,67	76,28%	8.040,05
Belgium	11.225.207	370,71	97,82%	47.516,52
Bosnia and Herzegovina	3.824.746	75,00	39,62%	4.796,21
Bulgaria	7.226.291	66,56	73,63%	7.712,76
Canada	35.540.419	3,91	81,65%	50.271,07
Croatia	4.236.400	75,70	58,66%	13.507,36
Cyprus	1.153.058	124,79	67,02%	27.194,39
Czech Republic	10.510.566	136,09	73,02%	19.553,93
Denmark	5.639.565	132,91	87,50%	60.634,39
Estonia	1.313.645	30,99	67,62%	19.719,84
Finland	5.463.596	17,98	84,09%	49.541,29
France	66.201.365	120,90	79,29%	42.736,16
Georgia	4.504.100	78,80	53,47%	3.669,98
Germany	80.889.505	232,08	75,09%	47.627,39
Greece	10.957.740	85,01	77,68%	21.682,60
Hungary	9.861.673	108,93	70,77%	13.902,70
Iceland	327.589	3,27	94,04%	52.111,04
Ireland	4.612.719	66,96	62,95%	53.313,61
Israel	8.215.300	379,63	92,08%	37.031,68
Italy	61.336.387	208,53	68,82%	34.960,30
Kazakhstan	17.289.111	6,40	53,29%	12.276,39
Kyrgyzstan	5.834.200	30,42	35,59%	1.269,14
Latvia	1.990.351	32,01	67,42%	16.037,78
Liechtenstein	37.194	232,46	14,31%	

<i>Country</i>	<i>Population 2014</i>	<i>Population Density 2014</i>	<i>Urban Population as % of population 2014</i>	<i>GDP per capita (current US\$) 2014</i>
Lithuania	2.929.323	46,74	66,52%	16.444,84
Luxembourg	556.074	214,70	89,87%	
Malta	427.404	1.335,64	95,28%	
Moldova	3.556.400	123,93	44,93%	2.233,77
Monaco	38.066	19.033,00	100,00%	
Montenegro	621.800	46,23	63,83%	7.370,86
Netherlands	16.854.183	499,83	89,91%	51.590,05
Norway	5.136.475	14,06	80,21%	97.363,09
Poland	37.995.529	124,08	60,57%	14.422,84
Portugal	10.397.393	113,52	62,91%	22.080,89
Romania	19.910.995	86,56	54,39%	9.996,67
Russian Federation	143.819.569	8,78	73,92%	12.735,92
San Marino	31.637	527,28	94,17%	
Serbia	7.129.428	81,52	55,46%	6.152,87
Slovakia	5.418.506	112,68	53,76%	18.416,54
Slovenia	2.062.218	102,39	49,70%	23.962,58
Spain	46.404.602	93,03	79,36%	30.262,23
Sweden	9.689.555	23,79	85,67%	58.887,25
Switzerland	8.190.229	207,26	73,84%	
Tajikistan	8.408.947	60,08	26,69%	1.099,02
The fYR of Macedonia	2.108.434	83,60	57,03%	5.370,70
Turkey	75.837.020	98,54	72,89%	10.542,81
Turkmenistan	5.307.171	11,29	49,69%	9.031,54
Ukraine	45.362.900	78,30	69,48%	3.082,46
United Kingdom	64.510.376	266,65	82,35%	45.603,29
United States of America	318.857.056	34,86	81,45%	54.629,50
Uzbekistan	30.742.500	72,27	36,28%	2.037,70

Sources for this table are from the following: World Development Indicators, World Bank, <http://data.worldbank.org/data-catalog/world-development-indicators>, viewed on 10 August 2015