



U N
D P

*Empowered lives.
Resilient nations.*

Empowering Lives, Building Resilience

Development Stories from
Europe and Central Asia

Volume Three—Sustainable Energy

**United Nations
Development Programme**

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Letter from the Administrator



UNDP Administrator Helen Clark tests a solar-powered bicycle at the Zadar County Solar Education Center in Croatia in January 2013.

UNDP Croatia

Access to sustainable energy is fundamental to fulfilling basic social needs, advancing economic growth, and driving human development. Yet providing sustainable energy for all remains one of the biggest development challenges of the 21st century.

UNDP has supported many countries to promote energy access, expand renewable energy use, and improve energy efficiency, as part of its broader efforts to reduce poverty, achieve the Millennium Development Goals, and mitigate climate change.

I am pleased to introduce here the third volume of *Empowering Lives, Building Resilience*, a compendium of success stories from our work, which focuses this year on expanding sustainable energy in Europe and Central Asia. These stories demonstrate the transformational change in the lives of people and societies brought about through UNDP's support. Some stories are about just one school or village; others show impact on a whole country. Together, the stories demonstrate how energy and development challenges are closely inter-linked and how sustainable energy solutions can be replicated and scaled up to benefit people across the region.

These examples and good practices demonstrate UNDP's commitment to support countries to meet the ambitious goals set forward in the UN Secretary-General's Sustainable Energy for All (SE4ALL) Initiative. I hope they will encourage more innovation and action in this area.

Helen Clark
UNDP Administrator

Foreword



Sustainable energy is the theme of the third volume of success stories *Empowering Lives, Building Resilience*. In this volume we assembled a collection of development stories from Europe and Central Asia that put a human face on the region's energy issues and challenges, such as access to sustainable heating, energy poverty and energy security.

These stories demonstrate how the collaborative efforts of UNDP, national governments and civil society address these challenges and bring about lasting change in the lives of people, communities and countries.

Supporting policies and institutions to de-risk investment in energy efficiency and renewable energy, building capacities and knowledge about sustainable energy solutions, and creating financial mechanisms for their replication are the main topics covered in this publication.

The stories explain how UNDP uses grant resources to catalyse larger flows of public and private financing, and scales up investment in energy efficiency and renewable energy. They also document the far-reaching positive impact of sustainable energy on economic development, poverty reduction, health, education and the environment.

These success stories would not have happened without the support and commitment of our donors and partners, such as the Global Environment Facility, the European Union, national governments and bilateral donors that chose to channel their resources through UNDP. I take this opportunity to express our deep appreciation for these partnerships.

I am very pleased to release these stories on the eve of the UN Decade of Sustainable Energy for All 2014-2024 and hope that they will inspire new partners and countries in Europe, Central Asia and beyond to act together to guarantee sustainable energy for all and for the future.

A handwritten signature in black ink, reading 'Cihan Sultanoglu'.

Cihan Sultanoglu
UNDP Assistant Administrator and Director,
Regional Bureau for Europe and the
Commonwealth of Independent States



Introduction


Energy plays a fundamental role in human development. In cities and villages, in warm and cold climates, in rich and poor countries, everywhere on our planet, people need energy to survive, to raise children, to care for the elderly, to earn their living, to develop. The way energy is produced and consumed also has far-reaching implications for our environment, security and well-being. The challenge is to ensure we have enough energy to meet our needs without compromising the ability of future generations to meet theirs.

This publication presents a collection of stories from Europe and Central Asia that illustrate how energy and human development go hand in hand. They are based on the results of projects undertaken by UNDP and by our partners that have transformed the lives of people and communities by promoting sustainable energy. Whether about just one school, one village or one country, each story shows how specific energy-related development challenges can be overcome, and solutions replicated and scaled up.

Covering Central Europe to the Silk Road, these stories provide an important insight into key human development issues and put a human face on the region's energy challenges. Two decades of transition have produced many changes in how the countries of this region use energy. At present, some export large quantities of fossil fuels and boast some of the world's highest rates of energy intensity; others struggle to provide reliable and affordable energy to their own citizens. But whether in Croatia or Moldova, Armenia or Uzbekistan, the winters are long and cold. The need to provide sustainable and reliable heat to the region's 500 million residents is a common socio-economic challenge. Unlike in other regions where UNDP is present, in Europe and Central Asia the challenge concerns each country and citizen. For many it is a matter of survival.

Providing sustainable energy for all requires transforming the entire energy sector as well as changing individual behaviour. The stories in this publication illustrate how UNDP is partnering with national governments, civil society, and other development actors and donors, such as the Global Environmental Facility to make the transformation happen. They showcase how UNDP, through its development interventions, has supported policies and institutions that promote and de-risk investment in sustainable energy. Through this work, UNDP has also demonstrated a range of affordable clean energy technologies and practices, and leveraged significant financing for their replication throughout the region. Analysed together, our stories prove that transformational change happens when:

POLICIES are in place that create the conditions to make sustainable energy attractive to investors. Renewable energy laws in Albania and Montenegro, energy performance codes in the Kyrgyz Republic and Uzbekistan, the Energy Efficiency Law in Kazakhstan, and many other policies and by-laws, developed with UNDP support, have transformed markets and created new opportunities for investment and green growth.



KNOWLEDGE exists about sustainable energy solutions and technologies. Apartment owners and tenants, municipal workers, factory and utility managers, building architects and construction companies all have to be aware and know how to make sustainable energy choices, which technologies to apply, and what needs to be done to make their operations sustainable. By providing seed investments for pilot energy efficiency and renewable energy projects, UNDP has reached out and created essential knowledge, capacities and skills among hundreds of thousands of people, energy users and professionals, across Europe and Central Asia.

FINANCING is available to support replication and scaling up of sustainable energy solutions. This selection of stories highlights how scarce grant resources can be used to leverage a significantly larger amount of public and private financing for sustainable energy. In Armenia, foreign direct investment has been secured to restore a municipal district heating system; in Bulgaria, a new financial credit facility has been established offering affordable energy efficiency loans to homeowners; and in Croatia and Kazakhstan, UNDP's pilot investments have been scaled up many fold through state-funded programmes.

By addressing national and regional energy challenges in Europe and Central Asia, UNDP is also contributing to the UN Sustainable Energy for All (SE4ALL) Initiative, which calls for the achievement of three sustainable energy goals by 2030: ensuring universal access to modern energy services, doubling the share of renewable energy in the global energy mix and doubling the rate of improvement in energy efficiency. UNDP supports transformational change that lies at the heart of SE4ALL and the sustainable development agenda outline in the outcome document of the UN Conference on Sustainable Development, or Rio+20. As the UN Decade of Sustainable Energy for All begins in 2014, UNDP hopes that the stories told in this publication will inspire new partners and countries in Europe, Central Asia and beyond to join SE4All and act together to ensure sustainable energy for all.

Overview of Stories

UNDP partners with people at all levels of society to help build nations that can withstand crisis, and drive and sustain the kind of growth that improves the quality of life for everyone. On the ground in 177 countries and territories, we offer global perspective and local insight to help empower lives and build resilient nations.

Albania

Albania has plenty of sunshine—around 265 days a year. Now it is learning to harness the sun's abundant rays as a source of clean, renewable energy. UNDP has helped foster efforts to manufacture, install and maintain solar water heaters, towards nearly tripling installations by 2020 compared to a business-as-usual scenario. Those adopting the systems have found dramatic declines in costs, and testified that they have been good for private businesses and the provision of public services. In 2013, the Government passed a new law stipulating tax exemptions and other measures to accelerate uptake.

Armenia

Until recently, residents of Avan, a neighbourhood in Yerevan, were on their own in finding heat and hot water for their apartments. Today, a growing number tap reliable supplies from an environmentally friendly district heating system, made possible by a partnership between the private sector and the Government, supported by UNDP. After the Government for the first time agreed to guarantee the price of electricity, a company began building the system, investing \$10.7 million out of an expected \$16.4 million by 2012. Thirty large apartment buildings are connected, along with a school and two kindergartens; 46 more buildings will soon benefit.

Belarus

In the midst of transitioning to a market economy, Belarus has struggled with outdated technologies and limited resources to invest in new ones. High rates of energy use have become a growing concern. UNDP has helped state-owned enterprises, among the major consumers, to develop plans and find financing to become more energy efficient, resulting in significant savings. A generic business model now assists companies in managing investments, and a for-profit energy centre, the first of its type in the country, helps them access \$95 million in funding from its shareholders.

Bosnia and Herzegovina

Backed by UNDP, 37 municipalities—about a quarter of the total—developed their first environmental action plans. Seed grants, matched by local co-financing, helped kick off smart energy management in schools, hospitals, municipal offices and other public buildings. Change was quickly evident to around 360,000 local residents, as thermal facades and solar collectors appeared on buildings, and insulation and biomass furnaces improved temperatures inside. An initial investment of just \$3.8 million yielded annual



A resident of Thethi, Albania, talks about solar water-heating systems with a TV journalist.

UNDP Albania

savings of \$660,000, convincing municipalities that energy efficiency is a sound investment. They've boosted future funding commitments by an additional \$43 million.

Bulgaria

Ageing multi-family buildings once attracted little interest in improvements—wealthier property owners moved out when they could. Then in 2007, a demonstration project began showing how residents who remain could join forces to better their living conditions. Fifty buildings in 13 municipalities established voluntary owner associations. These managed upgrades from the installation of new insulation and windows, to the replacement of ancient plumbing, resulting in energy savings of up to 60 percent. Residents found their living spaces were warmer, and through the associations, a spirit of communal responsibility bloomed. The Government plans to expand renovations to an additional 1,800 buildings.

Croatia

Croatia's national energy efficiency programme has delivered dramatic savings, reducing government energy costs by at least \$20 million in 2011 and 2012 alone. The programme took aim at public sector buildings, given their huge 40 percent share of national energy use. One of the most important steps was the installation of the web-based Energy Management Information System, which UNDP created. Today, more than 8,400 separate facilities feed data into the system; it covers 76 percent of the total floor area of all public buildings, and links more than 21,200 metering points. Croatia's successes have put it firmly on track to meet European Union energy efficiency standards.

Further progress has come through UNDP-supported demonstrations of renewable energy benefits. Projects include a Solar Education Centre and the provision of electricity to a remote household at one-third the cost of connecting to the electrical grid. Miniature solar power plants at 10 schools teach students about renewable energy while reducing electricity bills. Seven energy cooperatives include one on the island of Krk involving 300 building owners. Having shown their value, these experiences can be scaled up through an annual 1.4 billion euros in European Union structural funds.



Croatia's new Solar Education Centre responds to growing demand for solar system assemblers and installers by providing training towards professional certification.

Mihaela Bogeljić/
UNDP Croatia

Kazakhstan

Abundant fossil fuel resources meant Kazakhstan long overlooked its significant wind power capacity. UNDP worked closely with the Government to lay a foundation for development, assisting with detailed technical, commercial and environmental studies. Extensive data collection led to the online launch of the Kazakhstan Wind Atlas, which maps wind speeds for the entire country and has become a resource for potential investors. A new legal and regulatory framework includes a fixed price for electricity from renewable sources, designed to boost transparency in the power market and accelerate investment. By 2013, the first three commercial wind energy facilities had come online, with plans for an additional 13 by 2020.



In Moldova, a new generation is learning to advocate the benefits of sustainable, efficient energy.

Milai Maciucă/
UNDP Moldova

Moldova

Moldova's move towards renewable energy has brought a boom in the biomass fuel business. Since the fuel is relatively clean and inexpensive, it's a triple win for consumers, businesses and the environment. A partnership between UNDP and the European Union has helped the fledgling industry get off the ground—since the two began collaborating with national counterparts two years ago, production has increased 10 times. Companies now manufacture 160,000 tons of fuel a year. Support has come through training on business plans and technical skills, a first national forum for producers to share experiences, and a new national fund helping entrepreneurs afford start-up costs.

Montenegro

Linking energy efficiency and illegal housing settlements can help solve challenges in each. The idea is simple. People in approximately 100,000 illegally constructed homes and buildings can draw on low-cost loans to invest in energy efficiency measures that cut their energy bills. The savings are enough to pay back the loans and secure titles to legalize the properties. Broader benefits accrue through increased tax collection and better public services. After a UNDP-assisted pilot project proved the approach could work, the Government developed a Law on Legalization designating energy efficiency investments as a path to formal ownership.

Tajikistan

Tajikistan has struggled with crippling energy shortages, but it possesses the means to mitigate them: an abundance of rivers and streams. One rural sub-district, Burunov, has learned how to capitalize on the power of water to generate electricity and improve living standards. It has installed a 200-kilowatt small hydropower station that provides power to 60 households and helps rural farmers process milk. To stimulate the use of small hydropower, UNDP has helped foster changes to the legislative framework that are expected to lead to greater use of hydropower in rural areas.

The Former Yugoslav Republic of Macedonia

UNDP took an innovative strategy with a proven track record—inter-municipal cooperation, where municipalities pool resources to reduce costs and provide better services—and applied

Overview of Stories

it to energy efficiency. The towns of Gevgelija, Bogdanci and Valandovo built capacities to plan energy efficiency projects, analysed local energy management and pioneered the use of specialized equipment for energy audits. As Gevgelija and Bogdanci began working together, they realized savings on staffing and procurement; both have earmarked funds for new energy efficiency initiatives. Municipalities in the Vardar Planning Region have embarked on a similar process, and the Association of Local Self-Governments recommended inter-municipal cooperation to overcome limited funds and other challenges to energy efficiency.

This family home was retrofitted to be energy efficient. This ensures savings of at least 50% on household electricity bills.

Vlatko Otašević/
UNDP Montenegro

Turkey

Turkey is a leading producer of domestic household appliances, yet lags on making them energy efficient. The imperatives of remaining competitive in an environmentally conscious world and cutting carbon emissions, however, have spurred actions to close the gap. With UNDP support, government and industry leaders have worked together on measures such as upgraded requirements for eco-friendly design and energy efficiency labelling, a market monitoring system and advanced testing services. In appliance stores, 50,000 sales staff tout energy efficiency benefits, while a public advocacy campaign reached over 9 million people with messages that efficient appliances benefit the environment and household budgets.



Albania



Solar-powered showers at the beach are a creative way to demonstrate the positives of solar technology.

UNDP Albania

Harnessing the Sun's Abundance

Albania has plenty of sunshine—around 265 days a year. What it hasn't had is much capacity to harness the sun's abundant rays as a source of clean, renewable energy. Gradually, that's beginning to change—in the National Park of Thethi, for instance.

Nestled high in the Albanian Alps, the park is home to one of the country's largest woodlands and a variety of endangered species. Spectacularly beautiful, it is also poor and remote, with few modern energy sources. Long distances to markets and limited land for agriculture make livelihoods hard to come by.

The park's striking scenery does attract tourists, however, and in the last few years, the business has boomed. Some 12,000 tourists per year visit today, compared to only 300 in 2006. Twenty-three guesthouses operate, but with mostly rudimentary facilities likely to discourage less adventuresome guests.

In 2012, UNDP, with funding from the Global Environment Facility, worked with local officials and the owners of the guesthouses to introduce some improvements. Eleven now have solar water heaters for comfortable showers and kitchen use.

Marie Marku, one of the owners, invested her own funds to co-finance the changes. Already, she sees a return. “I never thought that such an intervention would have such a great impact,” she says with amazement. “The number of guests has doubled, and I think a big part of the reason is due to the solar panels.”

Progress from the ground up

The changes in the park exemplify Albania’s emerging efforts to diversify its energy sources, a priority that its National Energy Strategy recognizes as key to meeting steadily rising demand and ensuring secure supplies. While solar water heating is a logical part of this process, the transition to it has been slow. High import duties and taxes made installation costs steep. Capacities to produce, install and maintain solar water-heating systems were limited. But the potential was there, given Albania’s sunny location.

Since 2008, UNDP has supported a number of measures to help reduce barriers. To cultivate change from the ground up, among the companies and professionals who produce, install and use solar water-heating systems, it helped establish training sessions for selected architects, construction companies and installers to learn new skills. To sustain the spread of knowledge, all 12 of Albania’s vocational centres developed curricula on installation and repair, and appointed qualified instructors to teach them.

Albania’s five producers of solar water heaters travelled to the Swiss Solar Consortium to test their products and learn how to improve them, including for certification based on European Union standards. Some manufacturers were already close to these. All benefited from suggestions to improve production.

Outreach to potential users encouraged them to move past thinking that solar energy was too complicated or expensive. With UNDP assistance, a creative advocacy campaign targeted communities all along Albania’s 450-kilometre-long coast. At beaches, a portable solar-powered shower was set up so that anyone interested could see for themselves how they might comfortably rinse off after a day at the sea.

Public information materials stressed how Albania is naturally suited for solar energy, and that the return on investment in solar water heating can be relatively soon. An online tool was set up allowing any citizen to calculate savings. Media outreach included television broadcasts as well as articles in trade magazines for banks, and the tourism and construction industries.

All 12 of Albania’s vocational training centres now offer courses on installing and repairing solar water-heating systems.

UNDP Albania



Making the case for change

Since nothing makes the case for change like actual experiences, UNDP also sponsored a series of demonstration projects, such as the one in the National Park of Thethi. Hotels along the coast, among the earliest adopters of solar water-heating systems, were assisted



Solar panels cover the roof of one of the largest hotels in Tirana, Albania's capital.

UNDP Albania

in upgrading and optimizing their installations, with 80 percent affirming new efficiencies and savings.

After the Ministry of Labour, Social Affairs and Equal Opportunities expressed interest in reducing the energy costs of social service institutions, UNDP experts determined that up to 60 percent of their electricity use goes to heating water. As an experiment, a solar water-heating system was installed at Tirana's Orphan House; electricity bills immediately sank by 67 percent.

Denada Seferi, the ministry's Director of Social Policy, says, "This initiative is not only a simple energy-related intervention—it impacts directly the life quality of children living here. Such a project inspires us to continue the transformation of all social care institutions."

By 2020, UNDP aims at encouraging the installation of 520,000 square metres of new solar panels for heating water. Under a business-as-usual scenario, total installations for the same period are projected at only 184,000 square metres. Installations have begun to grow, from a total of just over 50,000 square metres in 2009 to nearly 112,000 square metres by 2012—an increase of about 25 percent per year.

Legal momentum

A major boost for solar water heating occurred in 2013, when Albania passed its Law on Renewable Energy, using UNDP expertise to develop provisions to promote the systems. The law stipulates tax exemptions for installations, as well as guidelines on certification and labelling. Based on the law, new governmental regulations are being issued, including to reduce customs duties and value-added taxes on materials to produce solar water heaters, create a certification system for installers and define which building types would most benefit from adopting the technology.

Once these regulations are in place, annual sales of solar water-heating systems are expected to rise steadily by 10 percent per year, with the payback time on initial investments in equipment on average at under five years. After that, for the remainder of the 20-year average lifespan of most heaters, purchasers can continue to enjoy lower power costs.

With the law calling on municipalities to install the systems in all new public buildings and those undergoing significant renovations, Tirana has tapped UNDP support for implementation. Plans call for developing new standards, piloting installations in a day care centre and high school, training municipal staff and exploring financing options.

Since initial investments are one of the barriers to solar water heater conversions, talks have now begun on a new national renewable energy fund that could provide financing to a cross-section of applications. In the interim, the UNDP project and the Government are jointly funding innovative new projects by municipalities and industries, building on the successful experience with the tourism business. At some point, as different elements of transformation come together, the sun's rays will mean much more than just an enjoyable day at the beach.

HIGHLIGHTS

- All **vocational centres** now have courses on installing and repairing solar water-heating systems.
- Coastal hotels improved their systems, with **80 percent** reporting lower costs.
- After installation of a system at Tirana's Orphan House, electricity bills sank by **67 percent**.
- Installations of solar panels to heat water **more than doubled** between 2009 and 2012.
- Albania's 2013 **Law on Renewable Energy** gives a major boost to solar water heating.

Armenia

Thousands of young Armenians have taken part in environmental marches organized by UNDP.

UNDP Armenia



Heating Homes, Warming Lives

Arev Shirikchyan has always struggled to make ends meet, working two shifts to support her family. In the winter, her life used to become even more difficult, because she would often come home to a cold and dark apartment. Obtaining proper heat was an ongoing battle in her neighbourhood in Avan, a district of Yerevan, the capital of Armenia.

Two decades ago, after the boiler house supplying heat and hot water to her apartment building was abandoned, she had no option but to turn to a rudimentary wooden stove and a kerosene heater. Gradually, electricity supplies improved, and she used electric heaters, although these were expensive to run.

Shirikchyan loves her homeland and feels deeply rooted in her culture, yet the daily struggle for heat was among the reasons she dreamed of a better life for her two children outside Armenia. She and her husband often spoke of migrating to Germany.

And then, a new district heating system came to Avan, made possible by a partnership between the private sector and the Government, supported by UNDP. Shirikchyan and her husband abandoned plans to move.

“We would not have dreamed of this a few years ago,” she says. “Our children live in safe and warm apartments, and the memories of the cold and dark days are behind us.”

She wishes, thoughtfully: “We would like each and every citizen of Armenia to have similar living conditions.”

A need to shift direction

At one point, 90 percent of Armenia’s apartment and public buildings used district or centralized systems for heat and hot water. But in the post-Soviet transition period, these mostly collapsed, leaving people like Shirikchyan to find their own solutions.

The most readily available alternatives, like electricity, kerosene or wood, came with serious drawbacks: widespread harvesting of trees and environmental damage, indoor air pollution, overloads on the power system and a high cost for already stretched family budgets.

The Government called for changes in its 2002 Urban Heating Strategy, including greater private sector involvement. The 2005 National Programme on Energy Saving and Renewable Energy prioritized energy efficiency in buildings. But there was little movement to renew the district heating systems, despite the fact that many urban buildings had been configured for them.

Instead, the gas supply system was expanded and safety requirements relaxed. On apartment buildings, chimneys from individual dwellings began to sprout up multiple storeys, polluting the air above them, and raising risks from gas leaks and explosions. Since heat only went to individual apartments, entries and hallways remained freezing cold.

In 2005, UNDP began working with the Government, drawing on financing from the Global Environment Facility, to see what might be more sustainable over the longer term.

Students at Ayb School celebrate the greater comfort from improved heating, cooling and ventilation systems.

UNDP Armenia

Cogeneration offers a solution

As requested by national authorities and private investors, UNDP instigated 15 feasibility studies on different options for heating buildings. One study specifically examined district heating systems, finding that those powered by gas and supplying heat alone were too expensive.

On the other hand, modern cogeneration systems, which also use gas, but provide both electricity and heat, could be ideal in compact urban areas. With the right incentives for private investors, they are affordable, and have one of the lowest carbon footprints for heating from fossil fuels.

Based on these findings, the Government in 2006 for the first time agreed that if a district cogeneration system was set up in Yerevan, it would guarantee the purchase of electricity at a favourable price for five years. Subsequent regulations defined the calculation of charges for heat so they would be affordable and accurate.

Avan became the site for constructing the first system. UNDP helped bring together municipal authorities, the national Public Services Regulatory Commission and Bazoviy



Element, a Russian company, to agree on a way forward. The municipality provided previous district heating facilities free of charge; the commission extended state guarantees for the purchase of electricity. A heat supply company, AmRusCogeneration, was formed, with Bazoviy Element owning the majority of shares; the municipality retained a minority.

Construction began in early 2010. By 2012, the system was partially operational, with the company having invested \$10.7 million, out of an expected total of \$16.4 million. Thirty large apartment buildings now receive steady supplies of heat and hot water, along with a school and two kindergartens; 46 more buildings are in the process of being connected. Residents have been happy to discover that the price for heat has been about 20 percent less than for gas heaters in individual apartments.

Exploring alternatives

As the Avan initiative progressed, UNDP also worked with authorities in several smaller municipalities to see how they too could improve energy supplies and cut costs. The town of Spitak, for example, is located high in the mountains and sees cold weather, sometimes extremely so, for six months of the year. A boiler house and heat supply network had been built for 23 apartment buildings with state financing, but never put into operation. A feasibility study pinpointed a moderate investment that brought it online to provide reliable, low-cost heat.

The local municipal government provided partial funding, and with new knowledge gained from the experience, went on to invest in additional measures, such as improvements to the heating system and insulation in the local kindergarten.

In Aparan, UNDP assisted residents, condominium associations and local authorities to offset a 37 percent boost in gas prices. Gas metres were installed to measure usage accurately, encouraging people to renew their connections to centralized systems, and the gas supply system to a network of boiler houses was made more efficient. Nine apartment buildings installed new energy-saving windows and doors. By the following winter, the combination of these changes resulted in combination resulted in lower heating costs.

Both Spitak and Aparan now participate in the European Union's MODEL project, aimed at helping localities across Central and Eastern Europe to improve the capacities of local authorities to better manage energy issues.

UNDP also supported assessments of small and large boiler systems around the country. This encouraged several energy service companies to collaborate on a manual with guidelines on testing for safety and efficiency. The largest company, AEG Service LLC, has used the manual to adjust 18 boiler units, allowing it to scale up services and significantly improve performance.

Altogether, new and replicated projects encouraged by UNDP are expected, over their lifetimes, to save over 4,000 gigawatt hours of fuel and reduce greenhouse gas emissions by nearly 886,000 tons.

Stops and starts

Despite progress, Armenia's record on greater efficiency in heating supplies remains mixed. Negative opinions about district systems are deeply entrenched; many people continue to



Testing and adjusting boiler systems has resulted in significantly better performance.
UNDP Armenia

prefer individual heaters, as municipalities propose no other alternatives. In 2010, the Government withdrew the pricing incentives for cogeneration-based district heating, except for Avan, despite the success in catalysing much-needed private sector involvement.

A law on developing, managing and regulating heating supplies is needed to embed lasting changes. Much more could be done to convince decision makers, urban services planners and people at large to embrace new ways of thinking and acting.

It is clear, however, that a shift has begun. In a recent issue of the journal of the Builders' Union of Armenia, high-level national authorities from two ministries acknowledged the district cogeneration systems are a good idea. Samvel Srapyan, head of the Housing Stock Management and Municipal Infrastructure Division at the Ministry of Urban Development, noted, "Establishing district heating systems throughout the country requires significant investment...so further development of public-private partnerships is essential."

To Shirikchyan and thousands of people like her who now live, work and study in more comfortable places, for lower costs, the benefits are obvious. In their communities and beyond, they can testify to the need for change through the proof of their experience.



The renovation of a community centre in the Armavir region took energy efficiency into account.

UNDP Armenia

HIGHLIGHTS

- Feasibility studies confirmed the value of modern cogeneration systems.
- The Government for the first time agreed to **guarantee electricity prices** to spur private sector investment.
- In one area of Yerevan, **\$10.7 million** has been invested, out of an expected total of \$16.4 million.
- **Thirty large apartment buildings** now receive steady supplies of heat and hot water, along with a school and two kindergartens.
- Energy companies have used **new guidelines on testing and safety** to improve and scale up services.
- New and replicated projects could save over **4,000 gigawatt hours** of fuel and reduce greenhouse gas emissions by nearly **886,000 tons**.

Belarus

Energy efficiency measures have allowed the Keramica factory to manufacture bricks at more competitive prices.

Olga Samsonova/
UNDP Belarus



Efficient Technology for a Greener Transition

Keramica, a state-owned enterprise in Belarus' northern city of Vitebsk, was known for being one of the country's major brick producers. But it was never known for energy efficiency. Factory managers focused on churning out bricks, paying less notice to by-products like wasted heat and greenhouse gas emissions.

In 2008, through a UNDP project, some changes began to take root. Faced with steadily rising fuel prices, Chief Engineer Vitaly Saprikov was among a group of managers who began meeting with international experts to discuss new technologies to save energy and reduce emissions.

"Project assistance helped us explore innovative engineering solutions," Saprikov recalls.

With its own funds, Keramica introduced a new power supply system that cut fuel consumption for heat and electricity by 25 percent. Other steps optimized specific types of factory equipment, with energy and fuel savings of up to 60 percent.

The environmental and economic benefits soon became apparent. Greenhouse gas emissions fell by about 7,000 metric tons a year. And the company reduced its production costs by 9.3 percent, making its bricks more competitive. Keramica bricks exported to the Russian Federation are now as much as 40 percent cheaper than those produced by Russian firms.

“The technologies and knowledge we received will ensure the sustainability and competitiveness of our company, along with reducing carbon emissions,” Saprikov says, noting that Keramica on its own recently invested in a number of additional energy-saving measures.

Piloting production changes

Nationally, Belarus in recent years has increased efforts to promote energy efficiency and renewable energy. Carbon emissions continue to rise, however, and the amount of energy required to fuel a rapidly expanding economy is enormous. In the midst of a transition to a market economy, Belarus has struggled with a legacy of outdated, inefficient technologies, and limited resources to invest in new ones.

Energy security is a further concern, with up to 90 percent of fossil fuels imported at prices that continue to escalate.

Starting in 2007, with financing from the Global Environment Facility, UNDP, the UN Economic Commission for Europe and Belarus’ State Energy Efficiency Department came together to start dismantling some of the barriers to greater energy efficiency. The focus was the public sector, absorbing nearly 70 percent of the country’s total energy and fuel use. State-owned enterprises like Keramica are among the major consumers.

The programme focused on expanding energy savings by increasing efficiency in heat and power generation; upgrading pump and compressor equipment, since this soaks up as much as 45 percent of power in manufacturing; and recovering and reusing heat otherwise wasted as an industrial byproduct.

Four state-owned enterprises with high demands for energy stepped forward to learn and demonstrate how industries can plan, finance and enact efficiency measures. They included three producers of construction materials, and a utility providing heating, cooling and hot water to multi-family buildings.

The project helped enterprise managers investigate heat and power losses, design effective technical solutions, develop feasibility studies and business plans, and define investment options. Through a combination of mostly loans and their own resources, they raised nearly \$16 million, used to install a variety of technologies, such as temperature regulators for water boilers, detectors to monitor fuel combustion, and modern cogeneration systems that efficiently produce both heat and power.

Over the 15-year lifecycle of these changes, the four enterprises are expected to cut carbon dioxide emissions by over 374,000 tons.



As part of extensive public outreach, Energy Marathons mobilized thousands of school children to share ideas on saving energy.

Natalia Dolgikh/
UNDP Belarus

A new business model

The experience with the enterprises revealed that Belarus has resources and interested investors when it comes to energy efficiency. As one indicator, banks and the state have begun providing more loans, and companies have willingly absorbed interest payments on what they predict will be worthwhile investments.

Between 2007 and 2011, repayable financing for improvements in the four enterprises, from both bank loans and public funds, doubled from 19 percent to 38 percent of total financing. The balance comprises funds from the firms themselves as well as state budget grants.

Still, Belarus lacks hands-on experience with the comprehensive planning required for what are often capital-intensive conversions involving complicated technology. That realization led UNDP to join national partners in considering a variety of international and national best practices. Drawing on these and what was learned from the four pioneer enterprises, they developed a generic business and energy management model for firms across Belarus.

Intended as a starting point for businesses to move towards greater efficiency, it covers a number of basic requirements related to investment, planning and project cycles, all summarized in a set of guidelines.

In trainings and study visits abroad, state officials, energy specialists and investors learned how to adapt and apply the model based on their requirements. Twenty-seven state-owned enterprises developed investment agreements, and 15 have leveraged millions of dollars in new financing.

Sustaining engagement

Changes in individual enterprises are just the beginning of Belarus' journey towards energy efficiency. As initial momentum began to gather, UNDP looked for ways to help it grow. One tactic involved extensive public outreach. Project successes were widely shared through a media campaign. A series of national Energy Marathons mobilized thousands of school children across the country to put forward their ideas for saving energy.

Over 13,000 public officials, business representatives and others participated in dozens of trainings and seminars on the rationale for energy efficiency and basic steps to achieve it.

UNDP aided the establishment of the International Energy Centre, now a for-profit corporation that was the first of its type in Belarus. Its technical staff promotes the business and energy management model, and helps develop, manage and finance projects, including through loans or long-lease financing. Shareholders, mainly a large bank, have provided a \$95 million funding commitment. Over time, the centre expects to offer additional services related to monitoring energy performance.

In Belarus, as in many other countries, sustaining advances and permanently embedding energy efficiency as common practice will require revamping laws and regulations. The Government recognized this even before the project began in 2007, and had reduced some taxes and provided other incentives to promote efficiency.

But through comprehensive research, UNDP experts pinpointed several consistent hindrances to progress. Public sector budget rules, for instance, prevent energy efficiency savings from being returned to departments and other state entities generating them. And there is no standard method for monitoring and verifying improvements.

Based on the analysis, six new government regulations were adopted to start reducing these obstacles. Draft legislation is now under consideration to accelerate changes. If adopted, the new laws could have a powerful impact by adjusting budget practices and establishing verification standards, as well as opening the door to new public-private partnerships that could provide substantial investment resources. Belarus' economic transition could turn 'greener' if its technology can keep up.

HIGHLIGHTS

- Keramica, a state-owned enterprise, cut fuel consumption for heat and electricity by **25 percent**, greenhouse gas emissions by about **7,000 metric tons** a year and production costs by **9.3 percent**.
- Managers from four enterprises raised nearly **\$16 million** to introduce energy efficiency technology.
- Firms across the country have a generic business and **energy management model** to guide new investments.
- Over **13,000 public officials**, business representatives and others participated in dozens of trainings and seminars on energy efficiency.
- Shareholders of the International Energy Centre have provided a **\$95 million funding commitment** to finance energy efficiency.

Bosnia and Herzegovina

Improvements in insulation and heating in a school in Gradiska mean students and teachers no longer suffer from freezing cold.

Dragan Blagojevic/
UNDP Bosnia and Herzegovina



Piloting the Way to Energy Efficiency

In the winter, the kindergarten in Bosnia and Herzegovina's municipality of Gradiska was often freezing cold, with temperatures dipping to 7° Celsius. Swaddled in layers of heavy clothes, the kindergarteners could barely move. Teachers would rub their frozen fingers and stamp their feet to keep warm as they looked after their charges.

But then things changed. Under a drive to increase energy efficiency in public buildings, contractors restored the roof, installed additional insulation and replaced all the windows. A new boiler using renewable, environmentally friendly fuel—wooden pellets—was installed.

Today, it may be cold outside, but the kindergarten remains a comfortable 20° Celsius. "Before we were experiencing huge losses in heat and electricity," says Principal Dragana Grahovac. "Children now feel much more relaxed and do not need to wear heavy winter clothes. They can run around freely, play and enjoy themselves."

In another municipality, Bihac, the local Cultural Centre used to become so cold in the winter it would simply shut down. Enormous heating bills in an ageing building put a halt to concerts and plays with the first frosty days. But in 2013, the centre replaced its ancient furnace with a heating system that runs on renewable fuels, installed new windows and increased its insulation. For the first time in 20 years, local residents marked Municipal Day with concerts and events in the centre's warm environs. Energy costs have fallen by 70 percent.

Showing what works

The measures in Gradiska and Bihac are among 37 pilot projects initiated by UNDP across Bosnia and Herzegovina, in partnership with local and national stakeholders, and with funding from the Global Environment Facility and the Millennium Development Goal Fund. The pilots were designed to show how Bosnia and Herzegovina could begin addressing a longstanding problem: Public buildings squander energy—and public funds—for heating, cooling and lighting.

Recent studies found that buildings absorb 57 percent of the country's total energy usage, compared to 40 percent in European Union countries. About 20 percent of gross domestic product goes to energy, three times higher than in the European Union and United States. By European Union standards, the average public building in Bosnia and Herzegovina is rated completely energy inefficient.

Before the pilots, there were some positive steps forward. Thirteen municipalities signed the European Union Covenant of Mayors Agreement, with targets to increase energy efficiency and reduce greenhouse gas emissions. Some renewable energy sources had been developed, including hydropower and biomass for heating. But these efforts have been mostly ad hoc and scattered. The few renewable energy systems, despite operating for years, cannot yet connect to the power grid. Legislation and plans are not in place to encourage and regulate sustainable energy management.

The pilot projects have heightened attention to energy efficiency and demonstrated its multiple benefits: among them, reduced costs, the creation of green businesses and jobs, more money for local development, lower emissions and compliance with European Union commitments. A cross-section of people have readily seen the benefits—public officials, business owners, employees and citizens at large.

Small is strategic

Typically, large-scale efforts are viewed as the best way to rapidly improve energy efficiency. But Bosnia and Herzegovina has a complex, decentralized administrative structure that would have rendered this difficult. A strategic decision was therefore made to work from the ground up by pursuing smaller local projects. A focus on public buildings stemmed from the fact that they have been overlooked as energy users by various levels of administration, despite being a major energy drain. Building improvements can be done in phases, according to local resources and capacities.

Solar panels offering a ready source of electricity are among the technologies making the case for renewable energy.

UNDP Bosnia and Herzegovina



The process began with national and local authorities working together to identify municipalities willing to participate in implementing the pilot projects. Thirty-seven—about a quarter of the total—agreed to cooperate on developing environmental action plans. Through a series of participatory consultations, local officials, civil society representatives and members of the general public—over 12,400 in total—learned to make links to energy, water, waste and other issues. They forged agreement on priorities, and plotted short, medium and long-term goals. For many participants, planning was a first opportunity to learn about sustainable energy management, and establish procedures for smart energy planning and use.

To begin implementing the plans, UNDP provided seed grants for specific projects in schools, hospitals, municipal offices and other public buildings. Funds were matched and in many cases exceeded by local co-financing. Soon, change was evident to local residents—around 360,000 people. Thermal facades and solar collectors appeared on buildings. Insulation and biomass furnaces improved temperatures inside. Streetlights flickered on with long-lasting LED bulbs.

An initial investment of just \$3.8 million has already yielded annual savings of \$660,000. Convinced that energy efficiency is a sound investment, municipalities have increased funding commitments by around 60 percent; plans call for an additional \$43 million to implement further actions. A less tangible but critical sign of progress has been an annual reduction of nearly 2,000 tons of carbon dioxide emissions.

For businesses, the new measures offer opportunities to develop a whole new sector of the domestic economy—49 local companies have been involved in energy efficiency projects so far, contributing to an expanding pool of ‘green jobs’.

The momentum galvanized by the projects has changed attitudes, carrying the promise of continued, long-term progress. New local capacities to implement basic energy efficiency measures yielding an immediate return have undercut the previous misunderstanding that these are too expensive and difficult, and possible only in highly developed countries. Officials from nearly 80 percent of the municipalities now deem energy efficiency a priority issue, and agree that solutions need to be methodically planned.

Towards a national framework

Bosnia and Herzegovina does not yet have the national framework it needs to systematically drive greater energy efficiency, but the UNDP initiative has fostered movement in that direction. A national energy management information system was set up to measure and monitor usage, covering nearly 500 municipal buildings by 2013. Now that participatory local planning has been tested and proven its merit, the basic model could be easily adopted across the country.

Legislative reforms are in the works. A new national Law on Energy Efficiency moving towards adoption will define responsibilities and goals at different levels of public administration, and require energy efficiency action plans. It will provide the basis for secondary legislation to advance sustainable energy use and integrate European Union directives into national laws. Existing laws on national funding of environmental protection have been improved to factor in climate change and energy efficiency.

National progress is also evident on a related front through the establishment of the Designated National Authority for implementation of the Kyoto Protocol's Clean Development Mechanism, which encourages investments in emissions reductions. Assisted by UNDP to become fully operational, the authority has begun assessing and proposing potential projects. These include upgrades of a cement factory and several small hydro-power plants that could attract investments of €400 million. Bosnia and Herzegovina will gain state-of-the-art, environmentally friendly industrial facilities, cleaner electricity and new jobs, more evidence of the multiple benefits of sustainable paths to the future.

HIGHLIGHTS

- **37 municipalities**, about half the total, have piloted ways to increase energy efficiency and reduce costs in public buildings, with benefits for around **360,000 people**.
- In the municipality of Bihac, the local Cultural Centre took measures that cut energy costs by **70 percent**.
- Officials from nearly **80 percent** of the municipalities now deem energy efficiency a priority issue.
- Municipalities have increased funding commitments by around **60 percent**; plans call for **\$43 million** to implement further actions.
- **49 local companies** have been involved in energy efficiency projects so far, contributing to an expanding pool of 'green jobs'.

Bulgaria

*Dilapidated buildings
have been restored:
before (left) and
after (right).*
UNDP Bulgaria



A New Life for Old Buildings

“We are the envy of all the neighbours,” says Tsetska Georgieva with a proud smile, standing in front of her freshly painted four-storey condominium building on Chataldja Street in downtown Sofia, the capital of Bulgaria. As the chairwoman of the condominium council, she oversaw a recent renovation that cleaned up the building while making it more comfortable and energy efficient.

She points to a dirty grey structure across the street with a shudder. “That’s how ours looked. We were not sure if (the renovation would be) worth our money. Now we can say it was. It’s a joy to come back home.”

Georgieva’s building is one of 50 refurbished through a UNDP-assisted project to demonstrate the benefits of home energy efficiency. Homeowners, policy makers, international media and the European Commission are among those who have lauded the changes. In 2011, the project won the European Union’s Sustainable Energy Europe Awards Competition.

A growing problem

For decades, Bulgaria has struggled with a large supply of old multi-family residential buildings that leak and waste heat. Over 80,000 buildings sheltering 2 million people are in need of energy efficiency retrofitting—such as new insulation, air sealing and modern windows. Without these improvements, energy performance falls far short of national minimum standards. Energy use nationally is already high; residential buildings account for nearly a quarter of the total.

The challenge has been finding the will—and the funds—for changes. Although 97 percent of Bulgarian housing stock is privately owned, lower income people who populate many multi-family buildings are often cash poor. Many have had to face the choice between ‘eating and heating’. Sometimes spending over half their income just on heat, electricity and water, they restrict consumption even at the expense of comfort.

Until recently, almost no one thought of investing in making the buildings more efficient. Wealthier inhabitants of old buildings simply moved to new ones as soon as they could afford it. Over time, there has been a growing risk that unattractive residential complexes could eventually become socially stratified, urban ghettos.

By the mid-2000s, recognizing that the deterioration of housing needed to stop, the Government adopted a series of new laws and plans, including the Energy Efficiency Act, the National Housing Strategy and the National Programme for the Renovation of Residential Buildings.

Still, a specific strategy to organize the mass upgrading of multi-family buildings was missing.

Families unite

In 2006, UNDP financed a feasibility study mapping bottlenecks to the large-scale renovation of multi-family housing. The problems included the lack of professional management and maintenance, limited funding, and little sense of residents collectively ‘owning’ problems and acting to solve them.

No efforts were made to draw owners together to retrofit whole buildings. Instead, some individual homeowners had turned to a grey market to purchase windows and insulation, often of dubious quality.

In 2007, the Bulgarian Ministry of Regional Development and Public Works and UNDP developed a demonstration project to show how people in multi-family dwellings could join forces behind more systematic and effective renovations that would improve entire buildings. Experiences from the process could feed into new national policies guiding broader efforts over the longer term.

A first step was an information campaign featuring media outreach, city hall meetings, dialogues with owners and workshops for journalists. Municipalities, building owners and contractors had to apply to participate in the project; 50 buildings in 13 municipalities were selected.

Restoring pavements and updating drainage systems protects the building foundation: before (top) and after (below).
UNDP Bulgaria





Building residents became so committed to restoration that some provided financial assistance so neighbours could pay their share. The results are something about which all the neighbors are proud.

UNDP Bulgaria

As a condition for participation, buildings established voluntary owner associations. These managed the renovations, working with the project team to select contractors and obtain financing—half came from the ministry, and the other half from the owners themselves. Nearly 1,100 households took part.

Each renovation required three to four months. Besides new insulation and windows, entrances and doors were improved, and stairwells painted. Old plumbing systems were replaced, and where complementary funding was available, solar water heaters installed. Municipalities collaborated with the associations to beautify public spaces around the buildings, planting grass, laying sidewalks and installing playgrounds.

Energy audits on buildings that completed the energy efficiency upgrades confirmed savings of between 40 percent and 60 percent. For the 50 buildings, that translates into a total annual savings of nearly 8.5 million kilowatt hours plus a 6,700-ton reduction in carbon dioxide emissions. Over 30 small and medium-size construction firms participated in retrofitting activities, creating over 200 jobs a year.

For people living in the buildings, the impacts were immediate. Their living spaces were warmer and their energy bills lower. A spirit of communal responsibility started to bloom.

In the city of Blagoevgrad, members of a homeowners association were so eager for the changes that they covered 50 percent of the financial contribution due from one insolvent neighbour. Other associations helped members access social assistance and special loans to contribute their part.

The manager of an association in Dobrich even took the extreme step of mortgaging his apartment to pay the contributions of two neighbours who could not afford them or secure loans. They later returned the money; all three families today enjoy the greater comfort of their homes.

Progress becomes policy

If the project has changed individual perceptions of the value of collaborating on energy efficiency improvements, it has also altered the direction of national practices and policies. With a model for improvements at hand, the Government has made energy efficiency in multi-family buildings one of the main tools to comply with an international commitment to increase energy efficiency by 25 percent by 2020 and reduce use by 10 percent.

The Ministry of Regional Development and Public Works has established a specialized Housing Policy Department that oversees the new National Home Energy Renovation Programme. In 2012, renovations were scaled up through a commitment of 63 million euros in European Union structural funds. A National Energy Efficiency Fund is in place to guarantee long-term, low-interest loans for energy efficiency measures that are affordable for most homeowners. Changes to the Condominium Law have made it easier to establish homeowners associations.

The Government plans to allocate 320 million euros to further expand renovations from 2014 to 2020, aiming at an additional 1,800 multi-family buildings. That's a long way from the original 50—a sign that steady progress will be sustained.

HIGHLIGHTS

- **Fifty multi-family buildings** were refurbished to demonstrate the merits of home energy efficiency; nearly 1,100 households benefited.
- The project won the European Union's **2011 Sustainable Energy Europe Awards** Competition.
- The changes annually save nearly **8.5 million kilowatt hours** in energy use and reduce carbon dioxide emissions by **6,700 tons**.
- Over **30 small and medium-size construction firms** participated, creating hundreds of jobs.
- In 2012, the Government backed scaled-up renovations with **63 million euros** in European Union structural funds.
- It plans to allocate **320 million euros** to further expand renovations from 2014 to 2020, aiming at an additional **1,800 multi-family buildings**.

Croatia



Energy Efficiency Generates Massive Savings

Early in 2011, the energy efficiency team in the Croatian Ministry of Justice was alarmed at abnormally high rates of water use at Lepoglava Prison, a penitentiary dating back to the Austro-Hungarian Empire. Pumping water is energy intensive, so leaks waste both resources. A probe of underground pipes quickly located a major break. Fixing the problem cost just \$4,000, but saved the prison \$225,000 per year in water losses. Without vigilant monitoring provided by the national energy efficiency programme managed by UNDP, the leak would have gone unnoticed.

This is just one example of the dramatic savings that the energy efficiency programme has delivered to Croatia's public sector. In 2011 and 2012 alone, it reduced the Government's energy costs by at least \$20 million—recouping in two years what the entire initiative cost over eight years. At the same time, greenhouse gas emissions have been cut by an estimated 12 percent in the more than 8,400 buildings where the programme is active.

Launched in 2005 with \$4.4 million from the Global Environment Facility (GEF), the programme was designed to remove multiple barriers to energy efficiency in Croatia, which like many countries emerging from state socialism still wastes a lot of energy. In terms of the amount of energy required to produce each unit of its gross domestic product, Croatia consumes 12 percent more than the European Union average.

Setting a public example

The programme took aim at buildings, given their huge 40 percent share of national energy use. It targeted the public sector so the Government could show the way forward. One component covered buildings owned by central ministries and agencies, while a second focused on facilities owned by Croatia's 20 counties and 127 cities.

Winning political commitment was a crucial first step. With some sceptics dubious that progress was possible, the programme conducted a pilot in Sisak, a typical Croatian city with 50,000 people, and a legacy of polluting industries and war damage. Over two years, 24 demonstration projects diminished energy consumption by 13 percent and saved the city \$220,000 per year. They also cut annual carbon dioxide emissions by 780 tons.

This initial success piqued the interest of other towns, so the programme encouraged city mayors and county prefects to sign an 'Energy Charter'. They pledged to implement systematic energy management in all facilities under their jurisdiction. Within eight months, all 127 mayors and 20 county prefects had signed on, and the charter is now on proud display in virtually every city hall in Croatia. All 20 central government ministries made the same commitment, and the 11 largest public sector institutions followed suit.

Backing the engagement of officials was a comprehensive national media campaign to raise public awareness about energy efficiency. It featured a charismatic animated character, Gašpar Energetić, who helped his big-spending neighbour, Trošimir, implement simple energy-efficient measures in his home. He also starred in a short film for children, *Think of Tomorrow*. Over 500,000 copies have been distributed and shown during educational school hours.

Through 128 'info-points' in 52 towns and 12 counties, and a national network of seven information centres, citizens have found hands-on advice on making their homes more energy efficient. Counties and towns provide space and staff for the centres, while private producers of construction materials and appliances donate demonstration equipment.

New practices take off

Growing awareness fostered by the programme spurred action. Energy audits emerged as a vital tool in identifying a wide range of inefficiencies in public buildings. Between 2006 and 2010, UNDP conducted 1,069 audits covering 2.5 million square metres of 1,346 buildings. This stimulated a thriving industry comprising at least 17 companies and more than 150 energy audit experts. Audits have resulted in investments of more than \$30 million, welcome both for energy efficiency and 'green job' creation amid high unemployment.

One of the most important steps was the installation of the web-based Energy Management Information System (EMIS), which UNDP created to allow real-time monitoring and management of energy and water consumption in public buildings. Available to all Croatian public institutions free of charge, it is an easy and transparent tool to compare energy use.

The more than 8,400 separate facilities that feed data into EMIS comprise 76 percent of the total floor area of all public buildings. The system links more than 21,200 metering points, out of which over 330 are automatic. It contains more than 1 million energy bills, and more than 4 million manual and automatic readings. Over 3,000 user accounts have been created, with half active on a daily basis.

Today, teams of civil servants oversee energy and water monitoring and management within each unit of public administration, from individual buildings to ministerial headquarters. In eight years, 29,000 Croatian civil servants have participated in specialized energy efficiency training, and UNDP is encouraging recognition of 'energy manager' as an official full-time public sector job. Among those trained, 14,000 people have also learned about 'green office' practices, including Croatian President Ivo Josipović, who hosted a special energy efficiency training session for his senior advisers in November 2011.



Croatian President Ivo Josipović consults "200 Energy Efficiency Tips."
UNDP Croatia

The right public policies

For Croatia to sustain progress on energy efficiency, it needed to put the right public policies in place. The Government was committed to enacting these, spurred by European Union accession requirements. Officials drew on UNDP expertise to shape and pass the 2008 Law on Efficient Use of Energy, the 2009 Croatian Energy Strategy, the 2008-2016 National Energy Efficiency Programme and the First National Energy Efficiency Action Plan for 2008-2010. Ongoing assistance has helped refine legislation and technical regulations, with the latest example being an official methodology for energy auditing.

Sustainability has also come through public financing, encouraged as cities, counties and ministries all began reaping big savings from energy efficiency. Partial state funding began in 2008, when the UNDP programme was formally designated a government initiative. As of June 2011, it was fully government-funded. By the time UNDP wrapped up its involvement in October 2013, the initial \$4.4 million GEF grant had generated total government contributions of \$17 million. Even more important, the programme, with all its established practices, assets and much of its staff, was absorbed into national institutions led by a specialized agency under the Ministry of Construction and Spatial Planning.

Today, Croatia's successes have put it firmly on track to meet the tighter energy efficiency standards of the European Union, which it joined in 2013. It has set an example that other countries are eager to emulate. The programme has been replicated, at the Government's request, in neighbouring Montenegro, and similar efforts have begun in Bosnia and Herzegovina, and Serbia. Countries as diverse as Belarus and Tajikistan have sought expertise developed in Croatia.

As UNDP starts shifting its activities there from traditional development assistance to the export of good practices to other countries, the energy efficiency programme will top the list of knowledge it aims to share.

HIGHLIGHTS

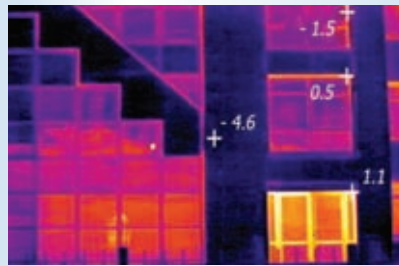
- In 2011 and 2012, the national energy efficiency programme reduced government energy costs by at least **\$20 million**.
- 127 mayors, 20 county prefects, 20 central government ministries and the 11 largest public sector institutions have committed to implementing **systematic energy management**.
- Between 2006 and 2010, **1,069 energy audits** took place in 1,346 buildings, stimulating a thriving new industry.
- UNDP created the web-based **Energy Management Information System**, which covers 8,400 public buildings.
- EMIS links more than **21,200 metering points**; it contains more than one million energy bills, and more than four million manual and automatic readings.

Upholding New Building Codes in the Kyrgyz Republic

In the Kyrgyz Republic, most buildings date back to Soviet times when energy was highly subsidized. The dissolution of the Soviet Union in 1991 made the country dependent on imports for about 95 percent of its energy for heating. Since buildings account for 37 percent of energy consumed in the country, a reduction of even 1-2 percent in energy use would yield huge savings.

In 2008, the Government set out to reduce energy consumption in the building sector by between 30 and 40 percent by 2020. In 2010, with assistance from UNDP, it adopted internationally recognized building energy performance codes and regulations.

Furthermore, a school in the city of Osh and a gym near the capital Bishkek were constructed to showcase the benefits of the measures. The buildings now consume 50 percent less energy than similarly sized structures. The work was assisted by UNDP and the Global Environmental Facility (GEF). The school was constructed with financial support from the Turkish International Development Agency.



Through a series of training courses, more professionals can now use thermal imaging and other techniques to assess energy performance.

UNDP Kyrgyz Republic



A more energy-efficient school in the city of Osh provides a better learning environment to 950 students and contributes to national goals for cutting energy consumption.

UNDP Kyrgyz Republic

Promoting energy efficiency through training

UNDP organized a series of training courses to demonstrate how to implement the new codes. Twenty-six professionals from the Architecture and Construction Agency were trained in energy performance assessments, energy savings and energy efficiency. Some 156 regional architects and construction inspectors from all seven regions of the country and Bishkek learned how to apply the new codes.

The project brought in a number of private design and construction companies. They participated in courses on the new energy-efficient building codes in order to use new design and construction standards for future projects.

UNDP also assisted in introducing energy-efficient construction techniques in all university and college engineering and architectural programmes by providing books and manuals. It supported the establishment of a thermal imaging laboratory to check the compliance of constructed buildings with their original design.

Measurable impact

The codes have seen significant take-up. In 2011, only 68 percent of building designs submitted for government approval complied with the new codes. By 2012, the rate had risen to 95 percent, based on 330 building designs checked by the UNDP-GEF team.

The Government appears determined to continue the work. The 2013-2017 government action plan highlights specific measures to promote 'energy-saving construction' by further strengthening building codes, and introducing additional policies and accountability measures.

Building to be Energy Efficient in Uzbekistan

In 2005, the Government of Uzbekistan decided to construct and renovate buildings to meet the needs of its rapidly growing population and improve the dilapidated infrastructure that it had inherited from the Soviet period. It resolved to deliver more than 10.8 million square metres of new and renovated space by 2015.

UNDP convinced the Government to invest in energy-efficient designs and technologies. It asserted that the Government would meet several objectives: conserve its energy supplies, and ensure better infrastructure for a population that numbered almost 27 million, 29 percent more than at the break-up of the Soviet Union.

In Uzbekistan, average energy consumption per square metre is seven times greater than in the European Union. Aiming for a 25 percent reduction in energy consumption, the Government revised and adopted 10 core national building codes and standards, with UNDP assistance. For the first time, energy efficiency concepts and principles were integrated into new building codes, including 53 new technical terms that define minimum energy efficiency standards.

Piloting new standards

An eight-building pilot was initiated by the Government, the Global Environment Facility (GEF) and UNDP to demonstrate the benefits of energy efficiency. School No. 2 in the Fergana Valley was one participant. In winters past, electricity and hot water would all but stop flowing to this school. To cope with the sub-zero temperatures, it would heat with coal, wood and sometimes dried cow dung. Makeshift stoves had been used to heat classrooms to tolerable temperatures. Sometimes children would study in heavy coats.

As part of the initiative, the school was fully insulated. New plastic double-glazed windows and doors were installed, and airlocks were introduced to reduce energy use. "I am very happy that our school will now be warm and well lit in winter and cool in summer because it has been renovated with new technologies that will save money and conserve energy," says Nozima Ibrohimova, an eighth grader.

Skills and markets grow

UNDP also provided people with knowledge to apply the new standards. Some 480 national experts from nine government agencies and design organizations were trained in the new building codes.

Three new educational standards, five educational programmes, one academic module and two training programmes were developed by the Tashkent State Technical University and the Tashkent Architecture and Construction Institute, supported by UNDP. Sixteen master's degree students, 200 bachelor's degree students and 160 construction specialists were trained.

In addition, the market for new energy-efficient construction materials and services has started to develop, creating new jobs and business opportunities. According to the national statistics agency, the portion of energy-efficient construction materials sold in the country made up 20 percent of all construction materials at the end of 2012.

The State is highly invested in the initiative. To construct and retrofit buildings in the eight-building pilot, the GEF contributed about 15 percent of the \$641,000 cost; the remainder was borne by the Government. To retrofit the planned 10.8 million square metres of new and renovated building space by 2015 will cost \$2.75 billion. Now the Government needs to scale up the work undertaken thus far.



Solar panels capture sunshine for energy in some rural areas.

UNDP Uzbekistan

Croatia

A solar technician is among the first to train for this emerging profession at the Solar Education Centre in Zadar.

Mihaela Bogeljić/
UNDP Croatia



Making Renewables Feasible—and Desirable

Croatia is blessed with all the natural assets to be a renewable energy pioneer. Its long coastline basks in almost constant sunshine; strong winds gust from the sea. Its rivers, streams and lakes comprise Europe's third-largest reserve of fresh water.

Nonetheless, it has been slow to realize the potential of renewables. Solar, wind and geothermal currently account for just 2.5 percent of primary energy production. Add in hydropower, and Croatia's share of renewables surges by 22.7 percent, but this mostly comes from the kind of big hydropower dams increasingly viewed as environmentally damaging rather than a model for a clean energy future.

Croatia's 2013 accession to the European Union has provided a strong rationale to change course. Like other Member States, by 2020, it must increase its share of renewable energy to 20 percent of total use, improve energy efficiency by 20 percent and reduce greenhouse gas emissions by 20 percent. Economic imperatives are another driver, with

shrinking budgets dictating reduced energy spending.

To move forward, UNDP has supported both small-scale pilots and large-scale strategies to help Croatia better grasp renewable energy benefits, building on the considerable achievements of the national energy efficiency programme (see pages 30-35). All support is geared towards ‘triple wins’ by at once addressing the three pillars of sustainable development—the environment, the economy and society at large.

Showing the way

In Croatia’s Dalmatian hinterland and other war-affected areas, UNDP has long worked closely with local authorities and citizens to improve living conditions and economic opportunities. Renewable energy is increasingly seen as part of the solution to the challenges they face.

A starting point was the Solar Education Centre that UNDP helped establish in the coastal city of Zadar. Created in partnership with Zadar County and the Vice Vlatković Vocational School, the centre provides free information to local residents on household uses of solar technologies. It also offers an innovative curriculum to train and formally certify assemblers and installers of solar water-heating and photovoltaic power systems.

Priority was given to enrolling unemployed students, showcasing the potential for ‘green jobs’ in a poor region. So far, the centre has graduated more than 100 solar technicians. They stand to benefit from an anticipated boom in solar systems, as prices for traditional energy sources continue to rise and the cost of solar technologies falls.

The centre caught the notice of a family of ethnic Serb returnees in a mountainous village called Ajderovac, isolated in a remote corner of Zadar County. Having rebuilt their war-destroyed farm, they had been living and raising livestock on 28 hectares without electricity. The power lines that once snaked up the mountain were destroyed in the 1991-1995 war, and the national utility judged the number of residents insufficient to justify costs to reconnect them to the electrical grid.

Although the family was spending one-fourth of its monthly income on diesel fuel to run a generator, the few hours of electricity produced each day were not enough to store milk or cheese or even run a refrigerator. The children did their homework by candlelight.

Since many Croatians in remote locations need off-grid solutions to their energy needs, the farm in Ajderovac became an opportunity to demonstrate how renewable, cost-effective energy solutions might solve this problem. Working with EnergyPLUS, a solar technology producer, UNDP installed a five-kilowatt solar power plant on the roof of the stables.

Access to electricity—at one-third the cost of reconnecting to the electrical grid—immediately expanded the family’s economic options by enabling them to produce and sell milk and cheese. Today, the Solar Education Centre shares their story as an example of innovation and the promise of renewables.

Solar panels on the roof of a stable offer hope that remote communities can access power at a fraction of the cost of extending the electrical grid.

Sunčica Pleština/
UNDP Croatia



Planting solar sunflowers

Success in Ajderovac persuaded Hrvatski Telekom (HT), Croatia's leading telecommunications provider, to select UNDP as a partner in advocating new energy solutions. With the company's support, UNDP installed miniature solar power plants at 10 primary and secondary schools across the country. Following the sun's course during the day, they were dubbed 'solar sunflowers'.

Delighted students watch how they work, while learning about renewable energy. Each school saves around \$400 per year on electricity bills. Children, parents and teachers can monitor the amount of electricity produced at each school through an online system, and compare results with other schools. Reductions in carbon dioxide emissions are also monitored.

Well-known for its commitment to corporate social responsibility, HT took full advantage of the solar sunflowers as an educational tool. It spearheaded a multimedia publicity campaign under the slogan 'Let's Turn to the Sun', and introduced promotional novelties such as billboards lit by solar power.

Since young people can be energetic advocates for innovation, UNDP sponsored the Solaar Band, a hit at alternative music festivals. Public events have inspired crowds to try a solar-powered bicycle built by the Vice Vlatković Vocational School, and taste treats from homemade solar cookers.

Another new frontier has been the creation of energy cooperatives to overcome the 'not in my backyard' syndrome that in many countries inhibits wind power and other renewable solutions. UNDP engaged with a network of NGO partners to encourage community groups to form cooperatives to pursue renewable solutions best suited to their needs.

Two years ago, Croatia had none of these; now seven are registered for energy production. The most advanced is the Energy Cooperative Krk, which aims to develop small solar photovoltaic power plants on the rooftops of members and in public spaces.

The island of Krk is a hotspot of environmental activism, and many residents enthusiastically support the goal of creating the first zero-emission island in the Mediterranean. More than 300 building owners have joined the cooperative, and their collective buying power has helped to reduce solar panel costs by 40 percent and project design costs by two-thirds.



Children dress up as 'solar sunflowers.' The in-school solar power plant saves money and provides hands-on learning about renewable energy.

Inia Herenčić/
UNDP Croatia

Considering the big picture

Smaller projects backed by UNDP and its partners have both fed into and been enhanced by broader public policy and strategy discussions. *Climate for Change*, Croatia's 2008 national human development report, broke new ground in frankly examining the threats of a changing climate.

Detailed analysis of the potential for 'green jobs' followed, since persistently high rates of unemployment cry out for translating environmental protection into a stimulus for people's livelihoods and the broader economy. The analysis concluded that a concerted focus on energy efficiency and renewable energy could create nearly 80,000 new jobs by 2020. It



Public advocacy tools have included billboards lit by solar power.

UNDP Croatia

provided the foundation for UNDP to support Croatia's preparation of a Low-Emission Development Strategy, mandatory for all Annex 1 parties to the Kyoto Protocol of the UN Framework Convention on Climate Change.

The existing demonstrations of the benefits of renewables give implementation of the strategy a head start. National and local governments have a chance of adapting or scaling up the initiatives pioneered by UNDP through an annual 1.4 billion euros in European Union structural funds. Croatia's Ministry of Regional Development and EU Funds is already working with UNDP on options in poor and isolated areas.

Showing by doing—even in a modest way, at the level of a community, or even a single household as in Ajderovac—has lent credibility to ideas that once seemed out of reach. More Croatians know that they are not just feasible, but also, on many levels, desirable.

HIGHLIGHTS

- The **Solar Education Centre** in Zadar trains assemblers and installers of solar water-heating and photovoltaic power systems.
- A solar power plant helped a farm family in Ajderovac access electricity at **one-third the cost** of connecting to the electrical grid.
- Miniature solar power plants at **10 schools** teach students about renewable energy while reducing electricity bills.
- Croatia has seven new energy cooperatives, including on the island of Krk, where 300 building owners enjoy **40 percent savings** on solar panel costs.
- Concrete demonstrations of the benefits of energy efficiency and renewable energy can be scaled up through an annual **1.4 billion EUROS** in European Union structural funds.

Kazakhstan



The first commercial wind facility was built near the Korday Mountains in 2011.

UNDP Kazakhstan

A Huge Potential for Farming the Wind

Once it was common for babies to be born in the dark at the maternity hospital in Kyzyl Orda, a rice-growing area and historic Silk Road site in southern Kazakhstan. After the collapse of the Soviet Union, rotational power cuts were applied to distribute scarce supplies. Many people grew accustomed to coping with sudden losses of light in their homes and businesses, but the stoppages endangered women giving birth.

With funding from the Global Environment Facility (GEF), UNDP in 1998 introduced a small wind power generator that kicked in when the electrical supply went down, one of the first cases of using renewable energy in Kazakhstan. Years later, the experience served as an example of how wind power can work. It became part of accumulating evidence that convinced policy makers and businesses that green economic development might be viable.

Today, Almasadam Satkaliyev, president of the Kazakhstan Electricity Grid Operating Company, says, “Kazakhstan has a huge wind potential, which should be used to diversify

electric power generation and reduce greenhouse gas emissions.”

If the country reaches a national target of installing 2,000 megawatts of wind power by 2030, the benefits could include an estimated economic stimulus of around \$18 billion, additional tax revenues of \$100 million, the creation of 1,500 well-paying jobs, enhanced rural development, greater energy security and a 4.2 million ton reduction of carbon dioxide emissions.

In other words, people will win and so will the environment. National development will become more sustainable.

High emissions: not the wave of the future

Kazakhstan's abundant fossil fuel resources have inspired a general reluctance to pursue other options. As a result, it has an energy-intensive economy, with one of the world's highest rates of greenhouse gas emissions per unit of gross domestic product.

Nearly half of emissions come from producing electricity and heat. About 85 percent of electricity is generated by burning coal. Relatively cheap electricity reflects the fact that most electrical plants are considered paid for since they were built long ago, and that pricing does not include damaging costs to the environment.

All these factors have discouraged energy efficiency, the participation of new investors in energy markets, and the exploration of technologies such as wind power.

In recent years, the Kazakhstan Government has started to realize the long-term implications of current practices, and a shift in policies has begun. The country's 2009 ratification of the Kyoto Protocol of the UN Framework Convention on Climate Change committed it to emissions reductions; the same year it adopted its first Law on the Support of the Usage of Renewable Energy.

By late 2012, the President of Kazakhstan had unveiled a national strategy for 2050 that called for half the country's energy to come from renewable sources by that year, and for accelerating the transition to a low-carbon green economy.

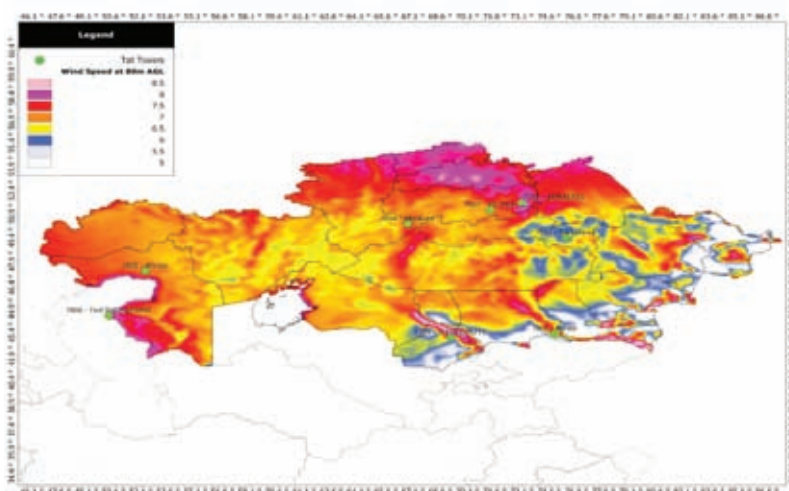
Opening doors to investment

With GEF funding, UNDP support for scaling up wind power began in 2004. Early on, it helped the Government identify barriers to adopting the technology, such as limited information about potential wind resources and a lack of incentives for investors.

An estimate of potential resources found that the country's large territory, with its high mountains and vast deserts, has a wind power capacity 18 times greater than that of the current network of electrical plants. With the

The 'wind atlas' of Kazakhstan mapped the wind capacity of the country, becoming a resource to attract potential investors in wind power.

UNDP Kazakhstan



right infrastructure, Kazakhstan could meet its own power needs and compete for business on markets abroad.

UNDP worked closely with the Ministry of Industry and New Technologies and a variety of national and international experts on a series of technical, commercial and environmental studies, covering issues such as connecting renewable energy suppliers to the national electricity grid, the legal framework, innovative financing mechanisms and the commercial viability of wind farms. The ministry set up a Renewable Energy Office, and a variety of training events provided over 200 civil servants and some non-governmental representatives with skills and knowledge in such areas as wind turbine technology and energy yield assessments.

Extensive data collection led to the online launch of the Kazakhstan Wind Atlas. It maps long-term average wind speeds for the entire country, with additional details for nine regions of particular interest. Prefeasibility studies were carried out at 10 sites, and a practical guide prepared for investors on requirements for developing wind farms.

To move towards the kind of stable and transparent regulatory framework critical to investment, by 2008 the Government had drafted its first National Wind Energy Programme, with the target of 2,000 megawatts of wind energy production by 2030. The following year, the 2009 Law on the Support of Usage of Renewable Energy Sources became a landmark in signaling that Kazakhstan was firmly committed to wind and other renewable energy developments.

The law outlined a financial support scheme as well as measures to prevent the common problem of delays and costs related to grid connections. Subsequent regulations spelled out the details of purchasing electricity, monitoring renewable energy supplies and conducting feasibility studies, among other issues. In 2013, supported by the close cooperation of UNDP and the European Bank for Reconstruction and Development, the Government amended the law to establish a fixed price for electricity produced from renewable sources, a measure to boost transparency in the power market and accelerate investment.

“UNDP constantly supported the ministry in the sphere of renewable energy,” says Kairat Rakhimov, head of the Renewable Energy Office. “As a result of joint efforts...Kazakhstan has favourable basic conditions for wind power development.”

Efforts to gear up supplies of wind energy are complemented by UNDP support for the more efficient use of energy, such as in this condominium building.

UNDP Kazakhstan



An industry takes root

Before the UNDP-assisted project ended in 2011, it was clear that interest was growing among investors. That year, the first commercial wind energy facility opened in the region of Korday Crossing, an initiative of the company Izen Su, in partnership with a proactive regional government. Two additional wind farms have begun operating in Karaganda and Kyzyl Orda—the latter being the site of the maternity hospital generator.

National Project Manager Ainur Sospanova predicts enthusiastically: “The eagerness of key actors of renewable energy development makes me believe that in the nearest future wind parks (will) become common in Kazakhstan. Every school (child) will be aware of renewable energy and the share of green energy will reach world rates.”

Kazakhstan does still face some barriers to transforming wind into power. While it ranks relatively high on World Bank measurements on ease of doing business, it does not

do well on some areas key to wind energy development, such as construction permits that remain overly complex. Steady progress and high levels of political commitment suggest that these hindrances will at some point diminish, however, because even in a country long focused on coal and oil, the value of the wind is now obvious.

Stefan Gsanger, Secretary-General of the World Wind Energy Association, goes beyond the strong possibility that Kazakhstan may be able to both cover its own energy needs and become an exporter of clean, inexhaustible power. He predicts, “The country could become a Eurasian hub for energy-intensive industries and for environmentally friendly production of energy-intensive products.”

More entrepreneurs, having measured risks and rewards, are starting to vote ‘yes’ for wind. Plans call for installing an additional 13 commercial wind farms from 2013 to 2020, for a total generation capacity of 807 megawatts. In July 2013, Samruk-Energy, a Kazakh company, secured a \$94 million loan from the Eurasian Development Bank to build a facility where 22 turbines will churn out 45 megawatts of electricity—it will be the largest wind farm constructed so far.

HIGHLIGHTS

- **In-depth studies** helped national policy makers better understand and address obstacles to renewable energy, particularly from **wind farms**.
- A national Renewable Energy Office was established, and training provided to over **200 civil servants** and some non-governmental representatives.
- Extensive data collection led to the online launch of the **Kazakhstan Wind Atlas**, one of several new resources for potential wind farm investors.
- The Government drafted its first National Wind Energy Programme and adopted the **Law on the Support of Usage of Renewable Energy Sources**.
- The first commercial **wind energy facility** opened in Korday Crossing, followed by two additional farms in Karaganda and Kyzyl Orda.
- Plans call for installing an additional **13 commercial wind farms** from 2013 to 2020.

Moldova



Biomass heating in a kindergarten provides a warm environment for learning and jobs for furnace operators.

Valeriu Corcimari/UNDP Moldova

The Better Business of Clean Energy

Moldova's move towards renewable energy supplies has brought a boom in the biomass fuel business. Since the fuel is relatively clean and inexpensive, it's a triple win for consumers, businesses and the environment.

Entrepreneur Oleg Donoaga set up one of the country's first companies to transform plant debris into biomass briquettes and pellets, which can be burned in special furnaces for heat. In just two years, AgroBioBrichet has grown from a start-up enterprise to one of Moldova's major producers, manufacturing enough fuel each year to heat 30 public buildings.

"We took a risk in an underdeveloped market," Donoaga recalls with pride, surveying a thriving factory where workers shovel piles of straw and agricultural waste into machines that compress them into log-like briquettes. These are easy to handle and transport, and burn efficiently. Every ton replaces about 800 kilograms of coal.

“At the beginning, the effort to promote the fuel was great,” he adds. “People wanted an alternative to gas, but were afraid to change.”

Donoaga credits a partnership between UNDP and the European Union with helping his business get off the ground—part of a whole new industry that takes Moldova closer to a future of sustainable energy use. The partnership stands behind the largest renewable energy project in the country. It takes a two-pronged supply and demand approach.

Deputy Prime Minister and Minister of Economy Valeriu Lazar explains, “The project has triggered the creation of both a market and an industry for renewable energy sources and technologies.”

Since UNDP and the European Union began collaborating with national counterparts two years ago, biomass production has increased 10 times; companies now manufacture 160,000 tons of fuel a year. After last winter, when AgriBioBrichet was unable to meet a sharp surge in demand, it took measures to boost capacity, such as investing in new sources of raw materials. It has also been active in installing production lines and advising new manufacturers.

In 2012, Donoaga took the stage during the Moldova Eco-Energetica Award Ceremony to receive recognition for the best biomass start-up. The ceremony has been one of many initiatives to stir public interest in the potential benefits of switching to biomass.

A quest for energy security

Moldova is one of the few south-eastern European countries almost totally dependent on external energy supplies. It imports nearly all of its electricity, natural gas, coal and petroleum products. With rising energy costs and growing concerns about energy security, the Government has set several ambitious targets to move towards energy independence.

By 2020, plans call for increasing renewable energy to 20 percent of total energy use, cutting energy consumption by 20 percent in public buildings and reducing greenhouse gas emissions by 25 percent.

The UNDP-European Union partnership has been vital in helping Moldova move towards its goals. An initial priority was to demonstrate the potential of biomass, both to policy makers and the public. Starting in 2011, the project helped install modern biomass heating systems in 130 schools, health facilities and community centres in rural areas throughout the country.

The benefits were quickly apparent. Over 37,000 people now spend winters in comfortably heated public buildings. Heating costs have fallen by at least 30 percent. Greenhouse gas emissions are expected to contract by up to 30,000 tons of carbon dioxide a year as biomass replaces coal and gas.

The production of biomass briquettes is booming, requiring investments in new production lines to meet surging demand.

Valeriu Corcimari/UNDP Moldova



Almost 900 children and teachers benefit from biomass heating in a kindergarten in the village of Dumbravita.
Elijah Hurwitz/UNDP Moldova



Nurturing an industry

Other advantages come from the fact that, through the growth of the domestic biomass industry, money paid for fuel stays in the country and can be productively invested. New businesses have created hundreds of new jobs, with more on the way.

Almost every day, entrepreneurs contact the project team about starting up biomass fuel production. So far, the project has trained 300 people on how to develop business plans and financial models, and acquire technical skills. This marks an important shift towards systematic support for a fledgling industry. In the early days when Donoaga went into business, he learned mainly by trial and error, and research online.

In 2012, a forum for bio-fuel producers, the first of its type, brought together entrepreneurs from across the country to share experiences and learn from each other on issues such as business modernization and quality assurance. Some entrepreneurs also attended the European Biomass Conference and Exhibition, an opportunity to establish links with big players in the European biomass market. Another group went on a study tour to the Czech Republic, Poland and Romania to see how these countries manufacture efficient biomass-based boilers.

With the biomass industry set to expand, guidance on quality control has become essential to establishing a foundation of trust in its products. The optimal performance of biomass heating systems will also control emissions and costs. In 2012, the National Institute of Standardization and Metrology adopted 37 European standards on producing solid bio-fuels. All manufacturers must comply with them.

Financing growth

With the early pilots having confirmed the value of biomass fuel, and demand on the rise as a result, the Government has been proactive in helping biomass manufacturing expand. The Ministry of Economy and the Energy Efficiency Agency, with project support, have set up a revolving fund for entrepreneurs who otherwise could not afford the start-up costs.

Potential producers can use the fund to either lease or purchase equipment. Those who opt to purchase can do so through three-year loans that are tax and interest free. “We aim at developing the private sector for biomass fuel production to make it accessible for everyone,” says Mihail Stratan, Director of the Energy Efficiency Agency.

Sergiu Ochincă is an entrepreneur who sold his home to start a biomass fuel production business. At first, he thought he would sell to the European market, but soon found, to his astonishment, that he could not meet demand in Moldova.

He is one of the first business owners to opt for the leasing programme to expand production. “The offer fits my business development plan like a glove,” he says with satisfaction.

HIGHLIGHTS

- Over two years, biomass production increased 10 times; companies now manufacture **160,000 tons of fuel** a year.
- One start-up enterprise manufactures enough to heat **30 public buildings**.
- **Three hundred entrepreneurs** have acquired business and technical skills related to biomass production.
- Modern biomass heating systems operate in **130 schools, health facilities and community centres** in rural areas throughout the country.
- Over **37,000 people** spend winters in comfortably heated public buildings; heating costs have fallen by at least **30 percent**.
- The National Institute of Standardization and Metrology adopted **37 European standards** on producing solid bio-fuels, with all manufacturers required to comply.

Montenegro

*The Pavićević family
lives more peacefully
knowing they can
heat their home
and have a path to
legal ownership.*

Vlatko Otašević/
UNDP Montenegro



Making Houses Energy Efficient— and Legal

Energy efficiency and illegal housing settlements are not often linked. But since Montenegro has significant challenges from both, an innovative solution has been to do just that.

The idea is simple. People in approximately 100,000 illegally constructed homes and buildings could draw on low-cost loans to invest in energy efficiency measures such as new insulation, doors and windows. These measures cut their energy bills. The savings are enough to pay back the loans in a reasonable time, and legalize the properties, with titles that guarantee property rights. Broader benefits accrue through increased tax collection and better public services.

UNDP developed the approach, and to test it, enlisted four households in an illegal settlement on the outskirts of the town of Bijelo Polje.

The Pavićević family was one. A construction worker, Siniša Pavićević, 52, lives with his wife and two sons. He started building his house himself back in 2004, but after three years, he could not afford to finish it or pay the fees for a legal title to it.

Even though the house had no finished façade, the concrete walls and floors were uncovered and cold, and the poor quality doors and windows fit badly, his family was happy to move into a home of their own. But soon they faced a constant struggle to stay comfortable. Harsh winters last up to eight months in Bijelo Polje, and the family could afford to heat only one room by a wood-burning stove. High electricity bills ate into the household budget, making coverage of basic expenditures a constant struggle.

Four years ago, their situation worsened when a serious illness left Siniša almost paralysed and unable to work. The family was reduced to living on a meagre monthly sum of 146 euros of social welfare.

When UNDP offered to conduct an energy efficiency assessment, provide construction materials and qualified workers to make improvements, and help arrange longer term financing for legalization, the Pavićevićs jumped at the chance. In around a month, they had a completed façade, new doors and windows, finished floors, a central heating system and a new chimney. Today, they heat the whole house, and cold air no longer leaks in from outside. Electricity bills have been cut in half.

“This has changed our life completely,” Siniša says. “The house is much more comfortable to live in, and I am at peace knowing I can legalize my house by paying in affordable instalments over time.”

Small changes could add up

The Pavićević family has been caught in a national phenomenon in Montenegro, where a decade of rapid growth has been welcome, but has not come without some negative spillovers. Particularly in urban areas, vast tracts of informal, illegal settlements have sprung up, pressuring infrastructure and often resulting in inadequate living standards.

The high price of electricity adds to living costs significantly above the means of many households, resulting in street protests in 2012. At the same time, energy use is high and inefficient.

In 2011, the Ministry of Sustainable Development and Tourism and UNDP first came together to explore the potential of an integrated approach to energy efficiency and illegal settlements, starting with the collection of data and evidence. In 2012, energy audits of 30 illegal homes in three municipalities, followed by the installation of energy efficiency measures in the four houses in the town of Bijelo Polje confirmed the potential for significant savings in use and cost.

Based on these findings, UNDP has estimated that retrofitting and legalizing all 100,000 illegal buildings over the next decade would bring benefits not just to families like the Pavićevićs, but to the nation as a whole, increasing tax revenues by 2.5 percent, for example, and gross domestic product by 1.5 percent a year. After four years, Montenegro would no longer need to import energy for electricity, increasing its self-reliance and energy security.

Energy efficiency retrofitting and legalization on a mass scale could bring benefits to families and the nation—such as a 1.5 percent annual increase in economic growth.

Jelena Rajkovic/
UNDP Montenegro



A new national plan

Forecasts like these made a convincing case for government action. In 2013, the Government adopted a strategy and action plan for legalization; a Law on Legalization is in the final stages of approval. The statute specifically designates energy efficiency investments as one path to legalizing private homes. A system of financial support for household energy efficiency improvements is under discussion.

“Legalization is one of the most important projects that the Government will be implementing in the near future,” notes Branimir Gvozdenović, Minister of Sustainable Development and Tourism.

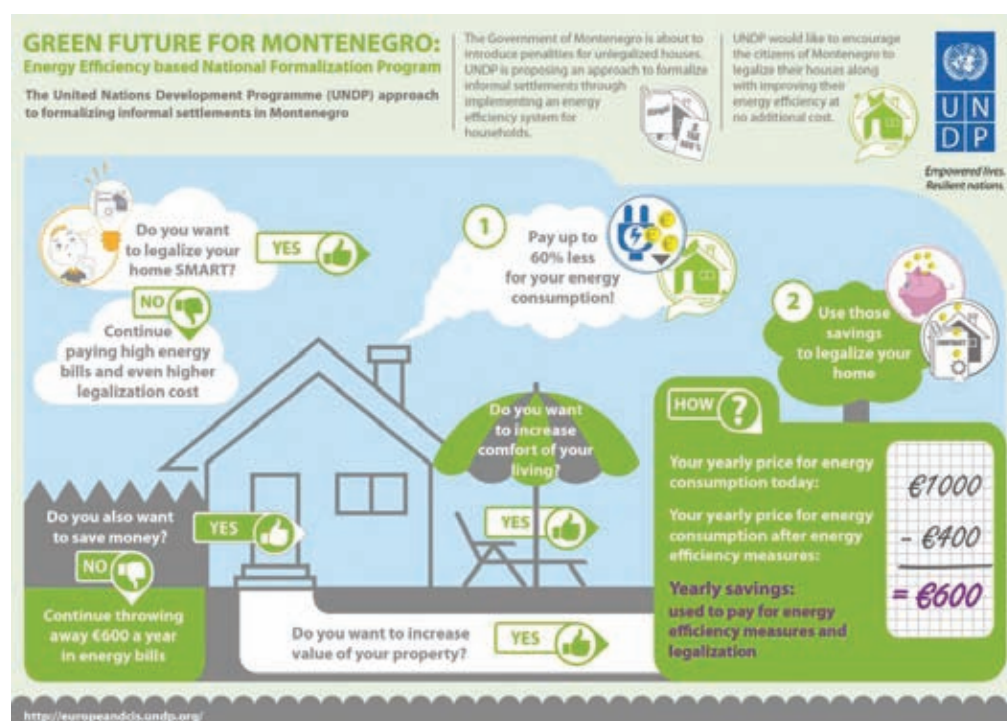
He estimates that it could bring some 400 million euros in taxes over the next seven to eight years, money that could be reinvested in improving the living conditions in illegal settlements. Another benefit: the potential creation of up to 20,000 new jobs in construction and other businesses.

Currently, the ministry, in partnership with KfW, the European Bank for Reconstruction and Development and the National Investment Development Fund, plans to extend support for combining energy efficiency measures and legalization to an additional 500 households. The effort will establish a firmer foundation for eventual national implementation of the new law.

Other changes are evident in Bijelo Polje, where the revamped houses and new government incentive programmes have helped stoke interest in energy efficiency. Municipal Energy Manager Blažo Vlaović lists some of the latest initiatives: “Building construction now uses energy efficiency methods for the façade and roofs for better insulation, energy-efficient briquette heaters are made available to residents, and 15 houses are equipped with solar water heaters with help from low-interest loans from the Government.”

UNDP uses simple and visually appealing graphics to explain the value of energy efficiency measures.

UNDP Montenegro



HIGHLIGHTS

- A unique programme links **greater energy efficiency** to solving the growing problem of illegal settlements.
- Energy efficiency improvements made four pilot homes more comfortable, and yielded cost savings to pay for **refurbishments and legalization**.
- Retrofitting and legalizing all 100,000 of the country's illegal buildings over the next decade could bring huge benefits, such as a **2.5 percent increase** in tax revenues.
- After four years, Montenegro would no longer need to import energy for electricity, bolstering its **energy security**.
- By 2013, a **Law on Legalization** was in the final stages of approval, with specific provisions for energy efficiency investments as one path to legalizing private homes.
- Towards national implementation, current plans call for extending support for energy efficiency measures and legalization to an additional **500 households**.

Tajikistan

A small hydropower plant means this resident of Burunov has enough electricity to operate his first refrigerator.

UNDP Tajikistan



Rural Areas Connect to Small Hydropower

In Tajikistan over 70 percent of people live in rural areas. Over 14 percent often don't have enough energy to power and heat their homes. During Soviet times they benefitted from highly subsidized coal and diesel. Independence in 1991 made the country dependent on domestically produced electricity for heating. But supply has been insufficient to meet growing demand. In the cold months of November to March, energy crises have been known to hit.

While Tajikistan doesn't have many energy resources, it does possess an abundance of small rivers and streams. In rural areas, they offer great potential for small hydropower. But until recently several barriers prevented its spread.

At the national level, state-supported guarantees that are needed to lessen the commercial risks of small hydropower were missing. The state tariff system did not guarantee that the electricity produced would be sold at a price that ensures a reasonable return on

investment. At the local level, there is often no information about the potential of small hydropower and its benefits. People also had limited knowledge of how to construct, maintain and manage small hydropower stations, especially in rural areas.

Delivering energy savings

In 2010, UNDP began helping the country remove these barriers and address other development issues such as employment, health, education and poverty. The Burunov jamoat, a rural sub-district 30 kilometres from Dushanbe, was chosen to pilot this integrated approach.

With more than 22,000 inhabitants and a gushing irrigation channel, Burunov had the potential to capitalize on hydropower, not to mention other energy-saving technologies. But it didn't know how to harness the water. This community only had access to electricity for heating for two to six hours a day during the cold months.

That changed when UNDP helped it install a 200-kilowatt hydropower station and also trained local inhabitants in how to operate and maintain it. Together they established Dehoti Obod, a community-based organization to take over running the station.

The local health centre was insulated and solar panels were installed on the roof to provide an additional source of electricity for lighting. In addition, a new boiler was installed that reduces the use of coal for heating by 20 to 25 percent. A pump station that provides clean drinking water was also renovated. The local kindergarten and school were retrofitted with energy-efficient materials and solar water heaters.

Small hydro now provides 60 households, a kindergarten, school and hospital with access to power for the entire year. "Before people used to be hospitalized in miserable conditions—in cold, unhygienic rooms," said Zebunisso Alimova, a local resident. "Now the hospital is fully refurbished, rooms are insulated and warm, and even the personnel are friendlier. All this leads to speedier recovery times."

The measures have also improved livelihoods. With UNDP assistance Burunov established a milk processing facility. With power from the small hydro facility, the plant employs seven people and is able to process 500 liters of milk per day, helping people pursue small-scale agriculture.

"Before my wife used to sell milk in the Dushanbe market, but now the dairy buys milk from my house," said Rahim Sharipov, a local inhabitant.

Electricity brings multiple economic and social benefits especially for school children in Burunov.

UNDP Tajikistan



Improved legislation and regulation

To spur the use of small hydropower, UNDP has helped to foster an improved legislative and regulatory framework. It supported the creation of a law to govern the use and application of small hydro, including standardization, certification, tariffs, as well as the selling and purchasing of energy produced. The law was adopted in 2010. During 2010-2011, the government adopted 17 normative and regulatory acts with UNDP assistance to ensure implementation of the new law in rural areas.

In May of this year, proponents of small hydro passed another milestone when Barki Tojik, the national electricity grid, signed a power purchase agreement with the Burunov hydropower plant. The agreement will provide an additional source of income for the sub-district. Hopefully, it will also pave the way for further investment in community-oriented hydropower development in a country that stands to greatly benefit from it.

HIGHLIGHTS

- A rural community has installed a **200-kilowatt hydropower station** that provides not only electricity but also income-generation opportunities.
- **Local residents** run the small hydro plant, a novel approach given Tajikistan's history of centralized electricity provision.
- The groundwork is laid for the expansion of **community power** after a new law was passed governing the use of small hydro.

The Former Yugoslav Republic of Macedonia



Municipalities are working together to better manage energy efficiency programmes, including for public buildings such as this school.

UNDP FYROM

Cooperation for Greener Municipalities

In the former Yugoslav Republic (FYR) of Macedonia, many municipal authorities know that energy efficiency is a good idea. They just don't always see how to attain it.

With the country's recent decentralization of government responsibilities from the national to the local level, municipalities have struggled to keep up with requirements that they develop new capacities and provide expanded services—including to increase energy efficiency as stipulated under the Law on Energy.

“We know these changes bring long-term savings, and we know they'll be better for the environment, says Mitko Vlahov, a civil servant in the town of Bogdanci. “But like with any difficult task, you need to have the know-how and the right equipment.”

A UNDP programme has offered a way out of this dilemma, one with a proven track record: inter-municipal cooperation. Municipalities come together and pool resources, staff and expertise to provide particular municipal services, typically resulting in reduced costs

and better quality. In 2006, when UNDP first introduced the concept for general public service provision, it quickly spread to three out of four of the country's municipalities, benefiting 800,000 people.

It made sense to try the same approach with energy efficiency.

Filling gaps together

Municipal officials have urged everyone to get involved in energy savings. The use of energy-efficient light bulbs saves money and lowers electricity use.

UNDP FYROM



FYR Macedonia has been highly and increasingly dependent on energy imports, which have risen from 37 to 48 percent of total energy use since 1999. Buildings are heavy, often wasteful users, emitting around 70 percent of total carbon dioxide emissions. Many public buildings are old and expensive to run; energy costs alone can consume nearly 10 percent of a municipal budget, at the expense of other important local investments.

The Law on Energy, linked to European Union requirements, makes municipalities legally responsible for performing energy audits of public buildings, developing annual action plans and three-year programmes on energy efficiency, and taking measures to boost efficiency. But the obstacles to implementation are high, particularly for smaller, rural municipalities with few staff, and limited skills and equipment.

In 2011, UNDP began working with national and local partners to pilot inter-municipal cooperation for energy efficiency. The initiative brought together the towns of Gevgelija, Bogdanci and Valandovo, which together have 45,000 residents. The first is a larger town, and was the only one of the three with an energy efficiency programme, although it was not in full compliance with the Law on Energy. The two smaller towns had not been able to develop programmes.

The project began with a basic training session on energy management and efficiency, and provided an introduction to inter-municipal cooperation. Additional efforts focused on building the capacities of local authorities to plan and manage energy efficiency projects, analyse data from energy audits and track energy use. A functional analysis of local energy management, the first of its type in the country, was carried out. The three municipalities pioneered the use of specialized equipment—such as thermal cameras, and instruments for measuring temperature and humidity—to conduct energy audits of municipal structures.

For the first time, all 14 public buildings in Bagdanci and 36 buildings in Valandovo were audited. Both municipalities used this information to develop their first energy efficiency programmes and annual action plans. Gevgelija brought its existing programme into compliance with the Law on Energy, and was able to avoid the costly past practice of hiring private companies for audits.

While Valandovo is still putting basic staff and other capacities in place, the process of training and information-gathering guided Gevgelija and Bogdanci in setting up an inter-municipal cooperation agreement. The analysis of energy management found, for example, that the two could share energy efficiency staff in one office, resulting in a savings of \$16,000 a year. Additional savings come from joint procurement processes and common equipment.

Besides helping to develop local government capacities, the project launched a social marketing campaign to build broader public support. Sports events, art exhibits and performances reached out to several thousand young people in particular. Speaking to students at

The Former Yugoslav Republic of Macedonia

the secondary school in Bogdanci, Mayor Risto Ichkov urged, “We should all worry about saving energy. This will reduce the need for importing expensive energy. And savings can be used to meet the needs of citizens in health, education and culture.”

A new approach takes off

With energy efficiency programmes in place, Gevgelija and Bogdanci have earmarked municipal funds to implement them. The former has assigned \$960,000 for six priority projects, including to reconstruct a primary school’s roof and replace its ancient boiler. The latter has dedicated \$21,000 for three projects, such as to install energy-saving bulbs in all municipal buildings. Soon local residents will enjoy warmer, cleaner, better-lit public facilities. Over the next three years, the two municipalities expect to save several hundred thousand dollars, and cut carbon dioxide emissions by nearly 1.3 million kilograms.

Word of the project’s impact has spread. As a result, eight of the nine municipalities in the Vardar Planning Region have embarked on inter-municipal cooperation for energy efficiency. By the end of 2012, they had set up a joint administrative unit and information centre.

Nationally, the Association of Local Self-Governments has recommended inter-municipal cooperation to overcome limited funds and other challenges to energy efficiency measures. The Government Commission for Stimulating and Monitoring Inter-Municipal Cooperation and the Agency for Energy have also endorsed the approach, and the Ministry of Local Self-Government has formally proposed financing it in its 2013–2015 budget.

HIGHLIGHTS

- For the first time, three municipalities agreed to improve energy efficiency through **inter-municipal cooperation**.
- A functional analysis of **local energy management**, the first of its type, identified savings through sharing municipal staff and other measures.
- **Energy audits** of public buildings informed municipal energy efficiency programmes.
- Two municipalities have earmarked nearly **\$1 million** to implement priority projects.
- **Eight of the nine municipalities** in the Vardar Planning Region subsequently embarked on inter-municipal cooperation for energy efficiency.
- The national **Association of Local Self-Governments** has recommended the approach to overcome cost and other challenges.

Turkey

Sales and marketing staffs from appliance manufactures and retailers learn to plug energy efficiency to Turkey's increasingly powerful consumers.

Deniz Tapan/UNDP Turkey



Efficient Appliances Suit Consumers, Businesses and the Environment

In a few short years, household appliances have become a booming business in Turkey. The country ranks as one of the world's leading producers of dishwashers, refrigerators, air conditioners and other staples of modern homes.

But Turkey has not advanced as quickly in making sure that new appliances are highly energy efficient. For their part, consumers in a growing middle class have tended to buy new goods because the upfront price was right, without understanding potential long-term costs to their household budgets or the environment.

Between 2005 and 2010 alone, household electrical use soared by a third, in large part due to new appliances. Annual sales more than doubled in a decade.

With these trends likely to continue as Turkey's economy grows, the Government and

manufacturers, assisted by UNDP, agreed it was time to take a stand and boost efficiency, as part of a move towards more sustainable development overall. This would help maintain the competitiveness of Turkish products in an environmentally conscious world, and cut energy use and emissions linked to climate change.

Today, a consumer who walks into an appliance store is likely to meet one of 50,000 sales staff trained to tout the benefits of energy efficiency. Murat Tekçe is one. He sells refrigerators and washing machines made by BSH, a global appliance manufacturer that has made Turkey a production hub for 30 countries and is a member of the Turkish White Goods Manufacturers' Association.

"We did not pay enough attention to energy labels before," Tekçe confesses. "Now we realize the importance of them and the seriousness of the issue."

Consumers may appreciate the efficiency sales pitch. A public advocacy campaign has reached over 9 million people with messages that energy-efficient appliances are good for the environment and can slash electricity bills by up to 50 percent.

A balance of interests

Turkey has ambitious goals for energy efficiency, and a national law mandating progress. The National Energy Efficiency Strategy aims to reduce the amount of energy per unit of gross domestic product by 20 percent between 2011 and 2023.

Appliances are one focus area, but until recently, not enough had been done to phase out less efficient ones, and monitor energy consumption and emissions. The Ministry of Science, Industry and Technology (MoSIT) was well accustomed to upholding product safety standards, but had devoted less attention to energy efficiency labelling.

Without much scrutiny or widespread consumer awareness, major appliance manufacturers had greater incentives to keep up with efficiency standards abroad, particularly in European countries, while lagging behind on the domestic market. Lower cost imports to Turkey, typically with low energy efficiency ratings, discouraged domestic manufacturers from upgrading their products.

With funding from the Global Environment Facility, UNDP helped convene government regulators and producers to work on balancing different interests—effective market surveillance and compliance with national regulations for the former, and fair market competition for the latter.

New standards, better compliance

Turkey's shift towards more energy-efficient appliances began with upgrading and updating regulations specific to different types—these spell out requirements for eco-friendly design and detailed energy efficiency labelling. As they are phased in and fully applied to all products, less-efficient appliances will no longer be allowed on the market. Overall, efficiency is expected to increase as much as 50 percent.

To ensure compliance, UNDP helped train 300 MoSIT staff members on the regulations. Following a report reviewing practices in the European Union and Turkey, officials from the ministry as well as the General Directorate for Renewable Energy travelled to the United Kingdom to learn from public and private sector counterparts there. Based on this experience, the ministry instituted regular training on managing market surveillance, and established a new department to enforce eco-design and energy labelling regulations.

Another step was to develop a market monitoring system to measure the energy consumption and emissions of household appliances. This would allow the Ministry of Energy and Natural Resources to routinely check energy efficiency progress. Ministry officials and appliance manufacturers worked together to define available data and gaps, and agreed on what would be mandatory for producers to provide. UNDP assisted in launching a database in 2012, with ministry staff trained to maintain and update it on a yearly basis.

With energy efficiency testing central to structured enforcement and verification, representatives from MoSIT, manufacturers and UNDP experts reviewed existing laboratories of the Turkish Standards Institute in Ankara and Gebze, as well as the research and development and testing labs of Arçelik and Vestel, two major appliance companies.

MoSIT subsequently made a strategic decision to test all current products either in manufacturers' laboratories or in facilities in the European Union, while the Turkish Standards Institute upgrades domestic facilities towards the goal of conducting all testing there. The ministry agreed on a market surveillance and laboratory investment plan that for the first time calls for backing market screening with advanced testing services.

Initial investments have already been made in expanding testing facilities for 'wet' appliances, such as washing machines and dishwashers, and air conditioners. Manufacturers provided skilled personnel and the use of their own laboratories in helping personnel from the Turkish Standards Institute select testing equipment and develop skills to operate it.

An energy efficiency fair in Istanbul provides opportunities for people to become informed consumers.

UNDP Turkey



Making consumers aware

Consumer awareness has been key to the push for energy efficiency. Training for salespersons of companies that belong to the Turkish White Goods Manufacturers' Association, such as Arçelik, BSH and Vestel, as well as sales teams in major department stores, such as Metro and Teknosa, began in earnest after a consumer survey showed that they were informing less than 3 percent of appliance purchasers of energy efficiency benefits.

The survey also found that only about half the people in Turkey knew about energy efficiency labelling. Awareness of the risks of climate change was relatively high, but fewer people grasped that their purchase choices could make a difference. These findings shaped the training for sales forces, helping them make links and explain the details of energy efficiency labels.

For the public outreach campaign, Arçelik lent expertise in creative production for spots broadcast on national television. These used colourful graphics to explain the different elements of energy efficiency labels. Flyers disseminated in appliance shops and department stores guided consumers on both buying and using their appliances.

When consumers today go to purchase a new dishwasher or fridge, they might think that their contribution to greater efficiency and lower emissions is small. But over time and many people, the savings add up. By the end of 2014, the measures already taken in Turkey are predicted, based on the new market monitoring database, to save about 3,700 gigawatt hours in energy use, and keep 2.4 megatons of carbon dioxide out of the air.

HIGHLIGHTS

- **50,000 household appliance sales staff** were trained to tout the benefits of energy efficiency.
- A public advocacy campaign reached over **9 million people** with messages that energy-efficient appliances are good for the environment and can slash electricity bills by up to **50 percent**.
- New regulations for specific appliances spell out requirements for **eco-friendly design** and detailed **energy efficiency labelling**.
- The Government established regular training on **managing market surveillance** and a department to enforce the regulations.
- A market surveillance and laboratory investment plan for the first time calls for backing up market screening with **advanced testing services**.
- **Initial investments** have been made in expanding testing facilities.



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