



**ANALYSIS FOR EUROPEAN NEIGHBOURHOOD POLICY (ENP) COUNTRIES AND THE
RUSSIAN FEDERATION ON SOCIAL AND ECONOMIC BENEFITS OF ENHANCED
ENVIRONMENTAL PROTECTION**

REGIONAL SYNTHESIS REPORT: ENPI East

**Synthesis report on: Armenia, Azerbaijan, Belarus, Georgia, Moldova,
Russian Federation and Ukraine**

Executive Summary



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EXECUTIVE SUMMARY

This is the executive summary of a regional synthesis report which has been prepared within the project '*Analysis for European Neighbourhood Policy (ENP) Countries and the Russian Federation on social and economic benefits of enhanced environmental protection*', initiated and supported by the European Commission's EuropeAid. This synthesis report was developed by the Institute for European Environmental Policy (IEEP), together with ARCADIS Belgium N.V. (project leader), Ecologic Institute, Environmental Resources Management Ltd (ERM), Metroeconomica Ltd and several independent experts.

The project covers the 17 partner countries: the 16 countries covered by the European Neighbourhood Policy (ENP) and the Russian Federation (see Box 1). This synthesis report illustrates a range of environmental issues which are important in the region or in specific countries within the region. It highlights the most significant benefits and the environmental improvements that need particular attention and collaboration between the European Union and the partner countries, and between the countries themselves. This executive summary of the regional synthesis report provides a summary of the specific country benefit assessment reports for the following partner countries: **Armenia, Azerbaijan, Belarus, Georgia, Moldova, Russian Federation and Ukraine** (here referred to as 'ENPI East' or as 'Eastern partner countries').

The country benefit assessments have been conducted by teams consisting of an EU expert and a national expert, using a Benefit Assessment Manual developed under this project. The Benefit Assessment Manual, which was originally for internal use, has been turned into a Benefit Assessment Manual for policy makers and experts for wider dissemination and provides an understanding of the methodologies applied for the country benefit assessments.

All project results, including the country benefit assessment reports, the regional synthesis reports for ENPI South and East, for which this is the executive summary, and the Benefit Assessment Manual, are planned to be published on the project website www.environment-benefits.eu and to become available upon request, from the European Commission's EuropeAid, DEVCO F3, Regional Programmes Neighbourhood East.

The value of the improving environmental conditions for people, society and the economies, of improving environmental infrastructures, of safeguarding biodiversity and wider natural assets (our natural capital) is far larger than many realise. In many cases improving the environment can help save money, avoid costs, often avoid important health impacts and improve welfare and also provide confidence in the role of the state.

Taking account of these values can help in decision making and governance during this period of economic crisis, of social unrest, in this turning point on the road to a green economy. These are times of change and there are major opportunities in improving the environment that will lead to synergies in policy objectives and help with jobs, livelihoods, savings, security (water, energy, natural hazards and food security) and health.

Box 1 The European Neighbourhood Policy (ENP)

The European Neighbourhood Policy (ENP) was initiated in 2004, with the objective of strengthening the prosperity, stability and security of the EU and its neighbours. It consists of bilateral policies between the EU and 16 partner countries: Algeria, Armenia, Azerbaijan, Belarus, Egypt, Georgia, Israel, Jordan, Lebanon, Libya, Moldova, Morocco, occupied Palestinian territory, Syria, Tunisia and Ukraine. A strategic agreement was also signed with Russia – the Strategic Partnership with the Russian Federation.

From 1 January 2007 the European Neighbourhood Policy and Strategic Partnership with the Russian Federation have been financed through a single instrument - the European Neighbourhood and Partnership Instrument (ENPI), which was designed to target sustainable development and approximation to EU policies and standards. In May 2011 the two joint Communications: '*A partnership for democracy and shared prosperity with the Southern Mediterranean*' and '*A new response to a changing Neighbourhood*' (EC, 2011a,b) were published, with a renewed commitment to cooperation with the states in the ENPI region. The aim was to strengthen individual and regional relationships between the EU and the partner countries by making additional funds available in exchange for more mutual accountability. Sustainable development –and environment - was one of the areas in which there was a strong commitment to make progress.

For instance, it is stressed that '*the EU will join up efforts with its neighbours on **climate change** by enhanced co-operation to address low-carbon development and improve resilience to climate impacts (**adaptation**), The EU and partner countries should also pursue a higher level of the development of new partnerships on **renewable energy sources and energy efficiency**, and nuclear safety* .

This benefit assessment aims to offer an evidence base to support the on-going dialogues and cooperation.

The aim of this project was to develop a first cross ENPI assessment to illustrate the scale of the potential benefits for the countries of addressing environmental challenges. This was to help raise awareness of the benefits and provide an evidence base on benefits to help those ministries and other actors wishing to take measures to improve the environment and help in the transition to a resource efficient, green, equitable economy. The aim was also to facilitate and encourage similar valuation exercises in the countries, whether at the national or local level on a range of issues of particular interest to the nations (see Box 2).

Box 2 Aims of the Benefit Assessments

The Benefit Assessments (BA) that have been conducted under this project, intend to help the partner countries evaluate the benefits of addressing environmental challenges they are facing, and in this way, assist policymakers by providing new evidence and values on:

- the key environmental issues affecting their country, i.e. the issues that could result in the greatest benefits if tackled appropriately;
- the impacts of these issues on society – i.e. in terms of social (e.g., health), economic (e.g., additional financial costs) and environmental (e.g., biodiversity loss) impacts;
- the benefits (economic, social, health, environmental) to society that can be achieved by taking action to protect the environment.

The assessments provide 'order of magnitude' results, in order to communicate the scale and significance of the potential benefits of tackling the issues and illustrate the value of benefit assessments

Box 2 Aims of the Benefit Assessments

to support policies. Common ENPI wide targets to be met by 2020 have been used to have a common basis to assess and illustrate the benefits. Clearly countries do not have the same policy aims, nor indeed do they have the same 'starting points', capacities, opportunities and ambitions for progressing and implementing environmental policy agendas. In some cases existing political commitments will match those used as the basis of the analysis here, and in other cases the ENPI wide targets might be too ambitious or in other not ambitious enough.

The objective therefore has not been to do an assessment of country policies, or 'judge performance or plans', and it is clear that many countries have made considerable efforts in recent years that may not be picked up in the analysis. Similarly, a range of countries have recently launched important strategies and plans to improve the environment or realise opportunities (e.g. renewable energies). The results in this study should be seen as offering evidence to support the commitment to these initiatives and naturally not as a statement that nothing is being done, as that is generally not the case. Clearly, the fact that this study had to rely on common targets from Marrakesh to Murmansk, while allowing a common setting across countries, underlines the need to see the results as a useful first estimate to illustrate the benefits, and encourage countries to explore further those issues where progress is possible on the near term policy agendas. In this regard, under this project, a benefit assessment methodology has been developed, that can be adapted more concretely to national circumstances.

The results of the benefit assessments conducted under this project have the potential to be of value to a wide range of stakeholders. (see Box 3). For specific questions complementary analysis fine tuned to the specific needs would be warranted – e.g. cities looking into land use planning decisions to traffic, green infrastructure investment, for land use classifications in an around the city (e.g. forests for water; areas for recreation, areas for protection and areas for habitation and industrial zones), or ministries looking into the likely benefits of a specific policy proposal would use different targets and probably also variation of baseline assumptions to allow due sensitivity analysis to fully understand the potential benefits.

Box 3 Organisations that can make use of benefit assessments

Organisation	Potential use of Benefit Assessments
Governmental institutions, responsible for a sector that will directly benefit from environmental improvements	Governmental institutions, responsible for a sector that will directly benefit from environmental improvements, such as ministries responsible for environment, water, energy, land use, agriculture, fisheries, health (in particular interested in the health benefits, such as avoided illnesses), labour, social affairs (in particular interested in the benefits related to jobs, poverty and rural livelihoods) and tourism. This report provides evidence of the benefits of environmental improvements that can support their arguments for implementing and funding environmental actions and for environmental policy integration.
Governmental institutions that decide on funding levels	Institutions, for example ministries of finance, that play an important role in deciding the funding levels for each other ministry, are also a potential user of benefit assessments. This is important, as it is the perceived benefits that drive policy decisions to allocate public resources to maintain and to improve the quality of the environment. Benefit assessments provide evidence of potential economic savings resulting from environmental improvements.

Box 3 Organisations that can make use of benefit assessments	
Organisation	Potential use of Benefit Assessments
Regional and local authorities	For similar reasons as the above mentioned governmental institutions.
Parliament	The benefit assessment reports can help legislators responsible for environmental matters to make the case for better environmental protection and conservation legislation.
The Judiciary (ministries of Justice); Environmental inspectorates/enforcement agencies	The benefit assessment reports provide evidence that supports their arguments for enforcing environmental legislation.
Local communities	The benefit assessment reports can help communities that depend for their livelihood on natural resources (e.g., forestry, fisheries) to demonstrate the value of the resources and the importance of preserving them, community management of community resources.
The private sector, civil society and the development partner community	The benefit assessment reports can help these stakeholders which jointly work on the common challenge of the transition to a resource efficient, effective, green and equitable economy, to set priorities for action. They also provide them with evidence when advocating for enhanced environmental protection.

As each country is characterised by its own economic, political and social conditions, and as the basic data used in these analyses are not always comparable across countries, one should not compare/benchmark countries against one another and the benefits calculated here should be seen in their context.

Similarly the regional totals should be seen as illustrative estimates. What the exact value will be, will depend on national choices on the paths to a green economy.¹

Box 4 provides guidance on the interpretation of the benefits that have been calculated under this project.

¹ Countries also have a range of specific interests not just in the fields covered in this report, but more widely (e.g., energy efficiency, desertification, chemicals), or needs for particular depth on issues covered here (e.g. jobs, rural livelihoods and poverty; or natural capital and tourism). Not everything could be covered by the existing study, and this should not be taken as a study judgement as to whether something is important or not - all environmental issues merit attention and it is a question of data, resources and tools. There is a growing discipline of benefit assessment and even difficult areas (e.g. chemicals) should become increasingly accessible for benefit assessment in due course.

Box 4 Interpreting the benefits expressed in monetary values

In **interpreting the** results expressed in monetary terms, it is worth bearing in mind that these are derived from a **mix of market and non-market values**. The market values will directly affect GDP (e.g. capturing the value of improved agricultural output). There are other effects – such as a reduced risk of suffering from chronic bronchitis – for which no market prices exist, and so do not affect GDP, but which people value. These values can be estimated through various methods and are used to present benefit estimate results in monetary terms in order to help communicate the importance of the issues.

Furthermore, where values relate to benefits related to international process (i.e. carbon prices used as regards climate change mitigation) the values are in Euros, and where they relate to e.g. health benefits associated with avoided impacts of air pollution, or other benefits, they are in € PPP (**Purchasing Power Parity**). PPPs are widely used as an alternative to monetary exchange rates when making international economic comparisons. They are, in effect, ‘real’ exchange rates, based on a comparison of the relative purchasing power of each country’s currency. Purchasing power parities equate the purchasing power of different currencies. This means that a given sum of money, when converted into different currencies at the PPP rates, will buy the same basket of goods and services in all countries, thus eliminating differences in retail price levels between countries.

The range of **carbon values** used in this project derives from different sources. For an assessment of avoided damage, the marginal value of damage from a tonne of carbon can be used and is a non-market value obtained from modelling the marginal change to the aggregate impacts of climate change in monetary terms as a result of the additional tonne of carbon emitted. Alternatively, for the assessment of costs of action to reduce carbon emissions, national marginal costs of emission reductions can be used, or if trading markets exist, then a Clean Development Mechanism (CDM) or trading price could be used (e.g. EU-emission trading scheme (ETS) price), to the extent that there is market access. This selection of values can quickly get complicated by the range of estimates available, and some countries have offered guidance values. Broadly speaking, these guidance values present marginal damage cost estimates that are higher than the costs of national action. Whether these latter cost estimates are higher or lower than the market prices given depends on the strictness of the emission targets/objectives and potential for action in both the domestic domain and in the carbon markets. In all cases the values will change over time.

Finally, those values relating to **wellbeing and human health** (e.g. avoided bronchitis or diarrhoea from polluted air or water, avoided early mortality), have been applied using a conventional benefits transfer approach. In this approach, a value derived in one country (e.g. the willingness to pay to avoid bronchitis) is ‘weighted’ by the relative GDP/capita between the country from where the value was derived and the ‘target’ country, in this study one of the partner countries. While this is acceptable at one level – peoples' willingness to pay for clean drinking water does tend to be broadly related to income levels (and GDP/capita a proxy for this), for health this is sometimes regarded as controversial - most notably with regard to the **value of avoiding early mortality** from pollution. In this case, this approach can lead to the interpretation that lives in countries with lower GDP/capita are in some sense not valued as highly as those in countries with higher GDP/capita. To avoid this complication, it is best, ideally, to use national willingness to pay estimates of ‘values of prevented fatality’. Where these are not available, the conventional benefits transfer approach with weighting may be used, noting clearly - to avoid misinterpretation - the caveat that the transferred estimate is an approximation, only, of the preferences of the citizens in the target country. Alternatively, where income levels between the original country and the target country are not too disparate, it is defensible (from an economic perspective) to use the original value, unadjusted by weighting given the substantial uncertainties still remaining in the empirical estimation of such values. It is also of

Box 4 Interpreting the benefits expressed in monetary values

course defensible (from a moral perspective) to have no GDP/capita weighting. In either case, care must be taken to be transparent as to the method and assumptions and not to confuse the instrumental benefit of an economic assessment (highlighting that lives should be protected) with the unintended consequence following from the mis-interpretation of 'value of lives varying across nations' (where 'traditional' GDP/capita weighting is applied). As a final cautionary note, it is likely to be the case in practice that if no assessment is done, the risk of losing lives is higher since the health effect may be under-valued in a policy appraisal. So whilst if valuations are used (as they are here) then one faces the controversy, the potential to save lives arguably merits the controversy.

Key Messages

Key messages from the work on the benefits of improving the environment in ENPI East in the areas of air, water, waste, nature and climate change, include the following.

Key Messages: Air

1. Air quality is currently a significant environmental hazard across ENPI East, in particular in major cities with high populations and/or industrial complexes close by, resulting in sizeable negative impacts on public health, ecosystems, crops and materials. Air pollutants result principally from stationary sources – such as metallurgical industries, mining, and oil processing sectors – and from transport (use of poor quality fuels, aging fleet, increasing number of private cars).
2. Principal benefits resulting from reduced emission levels of a range of pollutants include: improvements in human health (pulmonary and cardiovascular illness); higher crop yields (nine crops including potatoes, barley and wheat); and reduced soiling of building materials. Air pollution impacts on ecosystems and cultural heritage would also be reduced as a result of lower emissions.
3. Total emission reductions of sulphur dioxide, nitrogen oxides, particulates, volatile organic compounds and ammonia by 50 per cent from projected 2020 levels in all the Eastern partner countries are presented in the table below.

Table 1 Air pollutant emission reductions in the Eastern partner countries (thousand tonnes)

NH3	NMVOG	NOx	PM2.5	PMco	PM10	SO2
840	5079	2518	674	413	1087	3932

4. As a result of these emission reductions over the period to 2020, the numbers of premature deaths and cases of chronic bronchitis that could be avoided annually rises up to between 30,000 – 90,000 and 50,000 – 160,000 respectively by 2020.

5. The total monetised benefits realised domestically as a result of each country's reductions could be as much as €200 billion (PPP) per year, (higher bound estimate)² of which 90 per cent would be made within Russia, as a result of the emission reductions in that country.
6. According to the indicative estimates made, benefits of similar size could be realised per annum from 2020 if changes in impacts outside national borders as a result of domestic reductions were also considered (higher bound estimate). Benefits to human health are estimated to account for around 90 per cent of all the quantified benefits, due to reductions in the incidence of respiratory and cardio-pulmonary illnesses.
7. These results therefore suggest that future (or currently initiated) regulation should address both stationary and non-stationary sources and consider technological options as well as spatial planning.
8. Future research should focus on more detailed, context-specific modelling of the air quality impacts, as well as using this information to conduct cost-benefit analyses of alternative strategies to improve air quality.
9. Air quality strategies are likely to be more cost-efficient if they are designed to exploit synergies that exist with climate change policies that regulate greenhouse gas emissions. Such synergies should therefore be recognised in the design of national and regional environmental policies.

Key Messages: Water

10. Provision of a centralised drinking water supply varies across the Eastern partner countries. For urban populations, the highest levels of provision are found in Armenia and Belarus and the lowest in Azerbaijan and Moldova. For rural areas there is more variation between countries. In Armenia and Belarus over 70 per cent of rural populations have access to piped water supplies, but this is between 20 and 25 per cent in Azerbaijan and Ukraine.
11. The level of connection to the sewage network also varies. In some urban areas this can be relatively high. However, for rural populations the degree of connection to sewage networks is much lower and there are significant proportions of the rural populations without access to any form of improved sanitation.
12. Even in countries with relatively high coverage of population with piped water supply and a central sewage system, such as in Georgia, the water supply challenges can remain significant. Factors that impact negatively on the quality of drinking water and reliability of the overall water supply system include pollution (with untreated waste water) of surface water sources, worn out and badly maintained distribution

² This reflects the high end of the range of values estimated in Russia, which is €182bn – i.e. 90% of the high end €200bn total for ENPI East. Note that the results in the country reports only reflect the central range of values whilst the regional reports report the full ranges, reflecting the modelled uncertainties. Lower bound values for Russia and ENPI East in total are €56bn and €62bn respectively, whilst central values are €97bn and €107bn, respectively.

systems (with leaks and regular breakdowns) and inappropriate water treatment. The quality of the drinking water is problematic in particular in larger cities which take their water largely from polluted surface water sources. While tap water is often of inadequate quality, the situation is even worse for the population which is not serviced through a centralized drinking water system, in particular in some rural areas, and which consumes water from wells. Such water is usually not treated and often contains a high number of chemical and biological contaminants. The situation is worsened by the fact that water quality monitoring is often limited, both in the number of controls and of parameters. As such, public health and welfare is not ensured in several regions, with regular outbreaks of water related diseases, such as hepatitis, shigellosis and diarrhea.

13. Meeting targets of full connection to drinking water and sewage collection would mean an additional 53.6 million people in ENPI East, would have reliable and safe piped water to premises, and an additional 85.8 million people would have connection to a sewage network system.
14. Overall, across the region, the benefits that would accrue from improved drinking water quality and sewage connection would be between 31 million and 66 million annual cases of diarrhoea avoided and between 832 and 1,674 deaths avoided.
15. The annual monetised benefits that would accrue from improved drinking water quality and sewage connection would be between €4.8 billion and €10.4, billion for morbidity (avoided illness), between €0.84 billion and €1.7 billion for mortality (avoided early mortality), which would give total annual benefits of between €5.6 and €12.1 billion. These benefits represent between 0.14 per cent and 1.08 per cent of the GDP of individual countries. All values are in € PPP.
16. Surface water quality varies, with many water courses suffering from pollution, often from old or inadequate infrastructure, as well as from also from direct discharge of untreated sewage, also industry, inefficient agricultural practices (large irrigation schemes resulting in salinisation, heavy reliance on fertilizers and pesticides), tourism/recreation (at lakes and beaches with insufficient facilities, such as toilets or bins) and waste dumpsites. Improving this would bring significant benefits for residents and users, such as fishermen, and for property values, etc.
17. The benefits of meeting water quality improvements vary between €30.7 and €229 PPP per household per year. If compared to GDP the benefits would be 0.11-1.73 per cent of the GDP of individual countries.
18. Water scarcity is also a problem in some parts of ENPI East. In Georgia and Ukraine, while overall water scarcity does not seem to be a problem at national level, it is an issue at local level, because of the unequal distribution of the resources throughout the country. As such, the inhabitants of the semiarid eastern regions of Georgia frequently suffer from severe water shortages, while the western regions are subject to flooding due to an overabundance of rainfall. Droughts cause significant economic damage. Better water management would bring additional economic, as well as social and environmental benefits.

Key Messages: Waste

19. Municipal waste collection coverage is an issue in most Eastern partner countries. None succeed in reaching full waste collection coverage, especially in rural areas. Better coverage would avoid wild tipping or unmanaged dumpsites, burying and burning of waste, and their related impacts on health and environment. Jobs can be created as well as more viable living conditions.
20. A shift from dumpsites to well managed sanitary landfills would have a considerable environmental impact. Sanitary landfills avoid nuisance, odour, fires and smoke (often with dioxin emissions), runoff water impact, soil water impact and health risks from scavenging.
21. Recycling avoids the remaining landfill impacts, generates jobs and makes material resources available for the industry. Sorting at source and adapted collection systems are the first conditions to reach high quality recycling. The present informal recycling sector can be professionalised and its activities can grow considerably. Only a minor fraction (mostly metal, paper, plastic, and glass) of the collected municipal solid waste is being recycled in most countries. Increasing recycling can reduce material imports which can help in overall resource efficiency. Increasing recycling can reduce material imports which can help in overall resource efficiency and positively affect the balance of trade.
22. Back-yard (home) composting and capital extensive (windrow) composting of source separated material are good solutions to divert biodegradable waste from landfills, and it creates a valuable material to fight soil degradation.
23. Biodegrading wastes cause the production of methane, a strong greenhouse gas, which escapes from landfills and dumpsites. Avoiding these emissions through enhancing collection coverage and diverting biodegradable waste from dumpsites and landfills is the first and major measure to take when addressing greenhouse mitigation measures in the field of waste policy
24. Complementary methane can be captured on well-equipped landfill sites. Captured landfill gas can be flared (oxidising methane to CO₂ and reducing its impact with a factor 25), or it can be used to generate electricity or to be distributed as natural gas.
25. Calculable and monetisable benefit assessments can be made of: surface of avoided dumpsites, amounts of supplementary collected municipal solid waste, amounts of supplementary composted or recycled waste, jobs created for collection and waste treatment, overall value of supplementary sound waste management, based on WTP, and marketable values of avoided CO₂ equivalent emissions. This first ENPI wide assessment (using ENPI wide common targets) gives the following order of magnitude estimates of the benefits:
 - Enhanced waste coverage will likely lead to significant avoidance of polluted land – preliminary estimates suggest that this could be in the order of a 100 to 300 thousand m² for from Armenia to Georgia and Azerbaijan to millions of m² in other countries - 1 million m² in Belarus, 3.5 million m² in Ukraine and around 10 million m² in Russia.

- Increased waste treatment by expanding collection coverage and sanitary landfill capacity could avoid around 17.8 million tonnes of waste, lead to 15.6 million tonnes of additional waste recycled or composted and six and half thousand additional jobs generated in the region for landfill, recycling and composting.
- Overall around 30 million more people could benefit from increased waste collection coverage under the target, leading to around €2.6 billion (PPP) benefits per year for the region.
- There are considerable potential benefits from improved waste management also for climate mitigation. Over the region almost 4.9 billion m³ of methane could be avoided per year, with a value of around €4.6 billion per year.

Key Messages: Nature

Biodiversity is of immense intrinsic value and human well being depends upon it. It is the 'natural capital' that provides a country, its economy and its people with a flow of goods and services that are fundamentally important for prosperity, livelihoods and well-being. The values we receive from our natural capital are immense, and failure to adequately take these values into account in our decisions exposes us to the risk of losing yet more of it.

Biodiversity in the region

26. The status of biodiversity is poorly known in much of the region, but it is clear that there is on-going degradation of most ecosystems, and many associated species are declining. Consequently a substantial number of species are threatened nationally, some of which are at risk of global extinction.
27. The main threats to biodiversity in the region include: logging natural / near-natural forest, and expansion of commercial forestry (especially in Russia), overgrazing and desertification, expansion of agricultural land and agricultural intensification, wetland drainage, pollution, illegal hunting and overexploitation of some species, especially fish, and the spread of invasive species.
28. One of the principal means of protecting biodiversity (and associated natural capital) is through the protection of areas of very high biodiversity that are at risk of degradation. This is recognised by the Convention on Biological Diversity (CBD), which has set a target of achieving at least 17 per cent of protected area coverage of terrestrial and inland water bodies, and 10 per cent of marine areas, by 2020. Although it is difficult to obtain consistent and up-to-date data on protected area coverage (due to differing national interpretations of protected area definitions, and on-going protected area expansion), it is clear that the achievement of the CBD target would substantially increase the protection of biodiversity within the region. Only Georgia has a protection target that exceeds the CBD target (20.2 by 2010). Most other countries would need to increase their current coverage considerably to reach it, and go beyond their intended targets. The greatest increase in protected area coverage would be for Russia, as its current protected area coverage is only 2.4 per cent.

However, it is apparent that increases in protected area coverage would particularly benefit the biodiversity rich Caucasus region, the peatlands of Belarus and the wetlands and steppe lands of Ukraine.

29. It must be remembered that protected area coverage is a crude measure of biodiversity conservation effectiveness, as the strength of protection and appropriateness of land and marine management measures within protected areas is of key importance. In this respect it is clear that considerable improvements could be made in the designation of protected areas and in the effectiveness of protected area management in the region.
30. There is considerable uncertainty over the potential ecosystem service related benefits of increasing protected area coverage in the region. However, the assessments indicate that the most important benefits of increasing protected area coverage in the region are likely to be related to the protection of carbon reserves (especially in the peatlands of Belarus), the improvement of raw water resources in terms of quality and quantity (through better protection and management of vegetation in vulnerable catchments), capturing of pollutants from waste water and run-off (e.g. from agricultural land) in catchments of water bodies that are polluted or vulnerable to further pollution and habitat provision for threatened species. Some significant benefits could arise with regard to cultural services, but it is uncertain to what extent protected areas are needed to maintain such services in the region.

Forests, unsustainable forest management and carbon storage

31. Forest cover in the Eastern partner countries as a whole is at almost 48 per cent of territory; the highest level is in Russia, both in terms of percentage coverage (nearly 50 per cent) and particularly in area coverage (809 million hectares). Coverage in Belarus and Georgia is also very high with both around 40 per cent coverage.
32. Deforestation is currently an issue (at a net national level) only in Armenia and Georgia – though at a regional and local level there are challenges in most countries. Illegal logging and expansion of commercial forestry are threatening forests. A loss of a hectare of old growth forests generally implies a far greater loss of ecosystem services (carbon stored, water retention and storage) and biodiversity than afforestation achieves.
33. Forests mostly have multiple ecosystem services and generally designated and managed for a more restricted set of uses. Many forests have been designated specifically for production (particularly in Russia, Belarus and Ukraine), others for the protection of soil and water (particularly in Azerbaijan and Georgia, and also Armenia). A range of forests are also designated for the conservation of biodiversity (e.g. as protected areas) – up to 14 per cent in Belarus. Some are designated as multifunctional forests.
34. Carbon storage: forests in the Eastern partner countries contain just over 34 billion metric tons of carbon in living forest biomass, equivalent to almost 125 billion tonnes of CO₂. This is, however, an underestimate of the carbon storage in forests given that there are also important quantities in the soil and litter.

35. Meeting the ENPI wide target of halting net deforestation by 2020 will (at a net level) only be a relevant target for Armenia and Georgia (halting all deforestation would affect all countries as there is land use change in all) – with the potential to avoid the emissions of about 4.4 million tonnes of CO₂ from lost living forest biomass. This is small compared to the total carbon store, but nevertheless significant.
36. Value of carbon storage, avoided loss and stock gains: Assuming a value of CO₂ of 17.2 €/ton (low) and 32 €/ton (high) in 2010, the value of the carbon currently stored by the forests in the Eastern partner countries could be estimated to range between €2,000 to 4,000 billion (see later point on stock and marginal values). This is an indication of the value of the carbon stored in the living biomass today.
37. By 2020, the stock of carbon in living biomass - assuming projected carbon values of 39€/ton (low) and 56€/ton (high) – would suggest values of between nearly €5,000 and 7,000 thousand billion. In Georgia and Armenia, under the halting forest loss by 2020 target, between €170 and 250 million of potential carbon losses could be avoided.
38. To underline the benefits of forests as carbon store, an estimate has been made of the projection in carbon value from the continued growth of forests – this has been estimated to lead to a carbon gain of €6,000 to 8,600 million for the Eastern partner countries.
39. Countries considering own analysis would naturally wish to explore the net/gross loss issue in considerably more detail – ideally covering all aspects of carbon (living/dead; above and below ground; soil/vegetation) as well as key ecosystem services. There is a new momentum as regards appreciating the wider benefits of natural capital and new evidence in the partner countries would offer important added value to the global literature/evidence base and hence governance of natural capital.

Land degradation

40. Agricultural production across ENPI East accounts for between 6 and 18 per cent of GDP, with an average of 10 per cent. It is, therefore an important contributor to the economy.
41. However, much agricultural land suffers from degradation. Depending on the country, anything from 6 per cent to 100 per cent of the agricultural land is severely or very severely degraded. To cite an example, in Georgia nearly 35 per cent of agricultural land is degraded to some degree by water or wind erosion, which is, with desertification of land, the main identified type of human induced land degradation. Other types of soil degradation include loss of organic matter and biological activity, physical degradation, water logging, salinization and alkalization, acidification and loss of chemical fertility. The degradation is caused by climatic conditions, and largely by unsustainable agricultural practices (cultivation of steep slopes, land-reclamation schemes, chemical deterioration of the soil, due to uncontrolled use of pesticides and fertilizers standards, overgrazing). The land degradation heavily affects local households, leading to decreased land fertility, lesser yields, lower quality crops and, finally, increases poverty.

42. Better crop management systems and more sustainable agricultural practices (avoiding overgrazing, erosion and inefficient irrigation - leading to salinization) would tackle much land degradation, reducing the loss of soils, reducing soil salinity and replenishing nutrients and maintaining soil structure.
43. If these poor management problems are address, crop yields would increase from between 2.9 to 16.8 per cent across the region.
44. The benefits of improved crop production include health, environmental and on- and off-farm social and economic benefits. The estimated total benefit is € 8.1 – 14.6 billion (PPP) in 2020. This represents 0.1-0.15 per cent of GDP in Georgia and Russia and 1.5-2.0 per cent of GDP in Ukraine and Moldova.

Key Messages: Climate change

Renewable Energy Sources (RES)

45. Energy consumption causes around 2.0 billion tonnes of CO₂ emissions per year in the region, i.e. an average of 9 tonnes CO₂ per capita per year (the population of the region was 218 million in 2008). There is a wide range across the countries in the region, with per capital emission from energy going from 1.1 (Georgia) tonnes of CO₂/capita/year to 11.2 (Russia) tonnes of CO₂/capita/year, reflecting climate, energy resources and infrastructure, economic activity, and social norms.
46. Renewable energy sources (RES) contribute around 3.9 per cent of gross final energy consumption in ENPI East (in 2008). They provide 21.2 mtoe of a total of 549 mtoe final energy consumption for the region. The RES share ranges from 1.6 per cent (Ukraine and Azerbaijan) up to 36 per cent in Georgia.
47. Potential for renewable energies: The increased uptake of renewable energy sources represents a major potential for the region to reduce GHG emissions, offers health benefits (as the reduction of air pollution from fossil fuels combustion would improve air quality, reduce exposure to pollutants and hence reduce respiratory diseases) as well as addresses energy security, dependency on imported (Russian) energy (e.g. Georgia) and cost issues. RES has a potential to create new employment and be a driver of the economy. Also, renewable energy systems can support decentralized markets and as such encourage local economic development (Ukraine, Georgia). If a renewable energy project is being registered as a Clean Development Mechanism project, extra revenues through the sale of emission credits can accrue. RES, however, also have environmental impacts, most notably large hydro plant.
48. In ENPI East the amount of gross final energy consumption from RES, were a 20 per cent renewable energy target met in 2020, can be estimated at 115 mtoe – using a conservative energy conservation baseline (energy per capita remaining constant, with increases in use (transport, production, energy using products) taken to be compensated for by efficiency gains).
49. An increase of the RES share of gross energy consumption from current levels to 20 per cent is estimated to reduce CO₂ emissions by about 346 million tonnes CO₂ by 2020.

50. Assuming a CO₂ value ranging from €39 and €56 per tonne in 2020, the reduced emissions of CO₂ estimated above will represent a saving of between €13 and €19 billion per year in 2020. For the purpose of comparing the results to current money values, if the RES target were to be met today, the benefits from reduced emissions would be between €6 and €11 billion year given lower carbon prices (€17 and €32 per tonne in 2010).

Climate impacts and adaptation

51. A significant and accelerating trend in mean temperatures has been identified in this region. An increase of 0.41^oC per decade was observed for the period 1979 to 2005. By the end of the current century it is estimated that an increase of up to 5.5^oC may occur. Over this century rainfall patterns are likely to change, resulting in dryer summers but more extreme rainfall events resulting in increased flood risks.
52. These trends in climate are projected to result in a wide variety of impacts across sectors in the region. Whilst agricultural crops may benefit from enhanced CO₂ fertilisation effects, over time these benefits are thought likely to be outweighed by water constraints and flooding that both reduce crop productivity.
53. The most common impacts identified across the region are i) constraints on water resources arising from changing rainfall patterns combined with higher rates of evapotranspiration; ii) heat wave-related health impacts associated with respiratory and cardio-vascular conditions, and iii) the impacts on infrastructure and other resources as a result of river flooding.
54. The potential impacts of climate change on ecosystems and biodiversity, agriculture and coasts are also recognised as being significant.
55. The recognition that climate change is occurring and is likely to continue has led to a wide variety of adaptation measures being considered to combat this range of potential climate change impacts. Emphasis is being put on adapting to projected water resource constraints in order to provide security of supply to domestic and industrial users as well as agricultural producers.
56. Both man-made technological solutions and ecosystem based adaptation approaches (working with nature to adapt to climate change) should be explored on an equal footing and in light of wider benefits.

Recommendations

The insights from the country studies underline that the environment merits being given greater attention in policy making, implementation, financing and enforcement. This offers benefits in terms of cost savings, potential contributions to a range of important non-environmental policy objectives, to improved security (food, water, energy, climate) and to improved quality of life of citizens.

Strengthening national environmental policies/targets and obtaining due support for their implementation, should result in progress in each of the air, water, waste, nature and climate change domains. Such progress will be a valuable step in the transition to a green, equitable economy. Environmental technologies can be a core driver of green, equitable growth and of job creation. Improving infrastructures is an opportunity to benefit many millions across the region in access to quality services, for example the areas of water or waste management. Safeguarding productivity by avoiding the degradation of natural capital also has the potential to help improving the standard of living.

The assessments done under this project, should be seen as a first illustrative estimate and not be as a final definitive analysis. For national policy reflections, own analysis could usefully be carried out to complement the indicative calculated under this project. Having a core set of country specific assumptions with a range of scenarios and sensitivities would offer additional nuance and robustness. National/local policymakers and stakeholders could therefore adapt the analysis framework used for the country benefit assessments and tailor the methodologies that have been developed and applied under this project. All methodologies and assumptions are fully documented in the Benefit Assessment Manual (BAM), developed under this project. Like the other project results, the Manual is planned to be published on the project website and to become available from, upon request, from the European Commission's EuropeAid, DEVCO F3, Regional Programmes Neighbourhood East. This should facilitate countries wishing to complement the assessments in this report with additional and/or more tailored assumptions. The results of this project could thus be taken further by the countries and used for conducting their own national benefit assessment studies, in order to support good governance and facilitate identification of priority areas for progress. A culture of benefit assessments and taking account of the wider picture of benefits in decision making should be encouraged. Investment in measurement and data is key for management. There is a need for good data, indicators, and also a move towards (environmental) capital accounts and satellite accounts to help ensure that policy makers have due information at their disposal.

Finally, it should be kept in mind that the faster environmental policies are implemented, the earlier the benefits will be obtained and the longer these will be enjoyed. Acting quickly will also help avoid costs (of inaction) that can be significantly more costly than late action, so there is a double benefit of early action. There is a major potential for ENPI East countries focusing on a range of environmental improvements to help in the transition to a green economy. This will benefit not just the environment (water and air quality, conservation status, forest health and soil quality), but also benefit health and wellbeing, livelihoods (jobs and community viability), economics and financing (avoiding costs) as well as supporting good governance. Focusing on the environment should prove a key thread to sustainability in times of austerity.

