LOW EMISSION DEVELOPMENT STRATEGY BACKGROUND IN ARMENIA: PERSPECTIVES IN ENERGY AND AGRICULTURE

ANALYTICAL NOTE

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The objective of this paper is to identify policy instruments in the energy and agriculture sectors from the perspective of the Low Emission Development Strategy (LEDS). An attempt is made to assess the gap and to identify opportunities for LEDS integration into sector strategies.

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I. BASIS OF LOW EMISSION DEVELOPMENT STRATEGY

The **Paris Agreement (PA)** on climate change is the first legally binding global agreement, which devises a plan for avoiding the impact of the dangerous changes in climate by limiting the global warming «at a significantly lower level than 2°C». The PA offers to show a complex approach of development by providing inclusive and resilient economies with a zero level of carbon emissions in 2100 together with the 2030 Agenda and the Framework for Disaster Risk Reduction (Sendai). The PA is basing on the national promises of 192 countries on responding to climate change, known as the Intended Nationally Determined Contributions (INDCs) which after ratifying the Paris Agreement shall become a mandatory Nationally Determined Contribution (NDC) for the countries. The NDCs reflect the aspirations of the country for the reduction of greenhouse gas emissions (GHG), taking into account the local conditions and capabilities of the country. Moreover, the majority of countries includes in the NDCs also the adaptation goals. That is to say, the NDC is supposed to become a fundamental vision, according to which the climate change national, local and sectoral policies and activities are brought into conformity with the priorities of the national development and sustainable development goals (SDG). The NDCs support climate change and the formation of a more complete and nation-wise approach to sustainable development. The implementation of the NDC requires a new institutional framework, thanks to which the activity directed against the climate change breaks out of the limits of authorities of the ministries of environment and demands more inclusive approaches, with clearly defined mechanisms of inter-ministerial coordination, roles and responsibilities, including the involvement of the private sector. Nevertheless, the implementation of the NDCs requires a longer-term strategic framework. **In this respect, the low emission development strategy (LEDS) is the most important ground for the implementation of the NDCs. The Paris Agreement has applied to all involved sides with a call (Article 4/19) to devise greenhouse gas low emission development long-term mid-centennial country-wise strategies by 2020.**

The grounds for including the provision on LEDS in the PA article are much deeper and are dating back to the earlier sessions of the Conference of the Parties (COP). The Cancun Document, 2010, was encouraging the parties «to develop low carbon emission development strategies or plans in the context of sustainable development». And the Durban Document, 2011, called the developed countries to provide financial and technical aid to developing countries for devising these documents. This became grounds, for example, for the USA to launch an adequate capacity development program in cooperation with partner developing countries (Enhancing Capacity for Low Emission Development Strategies (EC-LEDS) program) and the LEDS Global Partnership cooperation platform.

Several countries, including the EU States, have already presented their LEDS, whereas the East Partnership Countries are only starting this process, which requires a clear expression of commitment.

The goal of the programme «EU4Climate» is to support the development and implementation of climate-change-related policies by the East Partnership Countries, which support the low emission development, and the accomplishment of commitments taken by the PA.

1. WHAT IS THE LOW EMISSION DEVELOPMENT STRATEGY (LEDS)?

The implementation of ambitious actions by countries for achieving the goals of the PA concerning climate change is crucial for keeping the increase of temperature below 2^0C and limiting the growth of the temperature below 1.5^0C. The LEDS gives guidance to countries in achieving these goals concurrently promoting the adequacy of climate change plans with a high level, sustainable, balanced and just growth. The strategy also gives grounds for identifying the framework of the needs for approximating the national actions with the PA global ambitions. The current commitments of the NDCs cannot be sufficiently ambitious for the implementation of the long-term goal of 1.5^0-2^0C, as they are

targeting a mid-term horizon. Accordingly, there is a need for significant and sustainable investments, as well as new policy mechanisms. A long-term strategy gives the country an exceptional possibility for devising perspective approaches to development and climate strategies basing on the achievements of the previous decades and guided by the aspirations of the coming ones. That is to say, the LEDS supports the solution of a wide range of issues, particularly:

- ✓ ensure a possibility to pursue ambitious development goals and concurrently accomplish climate actions;
- ✓ provide a long-term agenda for short-term and mid-term (NDC) commitments;
- ✓ give early and predictable signals to businesses and sectors with high emissions for planning their transition actions;
- ✓ provide cooperation, considerations of mitigation possibilities for the whole economy;
- ✓ develop an economic policy adequate to the trends of the technological progress in the context of transforming the challenges into opportunities.

The LEDS can involve a long-term vision, development considerations, mitigation and adaptation elements, sectoral strategies, implementation approaches, monitoring and reviewing processes. In spite of the presumption that the LEDS is focused on mitigation, the country can engage additional elements and considerations. The scope and depth of the LEDS are adequate to the national priorities.

Nevertheless, it depends on the level of preparation, possibilities and availability of resources. Article 4/19 of the PA states that the countries shall take into account «the commitments and corresponding possibilities which are common but also different in the light of diverse national conditions».

There is no universal approach, and a long-term strategy should be adequate to the national conditions and priorities.

Thus, LEDS is a framework for the implementation of a long-term, social-economic development and environmental planning which summarizes the steps for accomplishing the development goals and policies of the country, and concurrently reducing the GHG emissions. The LEDS together with climate resilience helps to import climate change considerations in the policy agenda and include into the framework of the government functions.

Not all countries have a formal «LEDS» document or process. Many countries integrate it into the programs titled «Green Growth», «Sustainable Development», «Clean Energy and Sustainable Land Use» and other documents. Regardless of the title, the **LEDS are characterized by a combined trajectory of development and reduction of GHG emissions.**

2. THE INTERNATIONAL EXPERIENCE

The beneficiary countries have different status and commitments under the UNFCCC (Belarus and Ukraine are Annex I countries). Georgia, Moldova and Ukraine have signed Association Agreements and Armenia a Comprehensive and Enhanced Partnership Agreement with the EU, which contain specific commitments for the countries to align with the EU Regulations on ozone-depleting substances (ODS) and fluorinated greenhouse gases (f-gases), as well as with specific provisions of the Emission Trading System (ETS) Directive in the case of Armenia, Moldova and Ukraine, the Monitoring and Reporting (MRR) Regulation and the Accreditation and Verification (AVR) Regulation (Armenia only) and the Fuel Quality Directive (Moldova only). In addition, Ukraine, Moldova and Georgia are members of the the Energy Community. Naturally, some of the countries are more advanced than others in terms of implementing the Paris Agreement, for example, Ukraine and Moldova have in place Low-emission Development Strategies.

This section addresses the experience of the countries having LEDS (Table 1), paying particular attention to the experience of the Eastern Partnership countries (2 in this case, as Moldova and Ukraine have LEDS). The international experience is presented according to certain

characteristics, which are most interesting at this stage in terms of starting the process of development of Armenia's LEDS. Accordingly, we will next look at the LEDS of countries according to their legal status, sectoral coverage, structural elements and implementation mechanisms.

Table 1. List of countries having LEDS

	Country /Document	Date of communication/development
1.	**Mexico**. Climate Change Mid-Century Strategy	16/11/2016թ.
2.	**USA**. Mid-century Strategy for Deep Decarbonization	16/11/2016թ.
3.	**Germany.** Climate Action Plan 2050	14/11/2016թ.
4.	**Canada.** Mid-century Long-term low-greenhouse gas Development strategy	17/11/2016թ.
5.	**Benin.** Low Carbon and Climate Change Resilient Strategy	12/12/2016թ.
6.	**France.** National Low Carbon Strategy	28/12/2016թ.
7.	**Moldova.** Low Emissions Development Strategy	30/12/2016թ.
8.	**Czech Republic**. Climate Protection Policy	15/01/2018թ.
9.	**UK of GB.** The Clean Growth Strategy	17/04/2018թ.
10.	**Ukraine.** Low Emission Development Strategy 2050	30/07/2018թ.
11.	**Marshall Islands.** 2050 Climate Strategy	25/09/2018թ.
12.	**Fiji.** Low Emission Development Strategy	25/02/2019թ.
13.	**Japan.** The Long-term Strategy under the Paris Agreement	26/06/2019թ.
14.	**Portugal.** Long-Term Strategy for Carbon Neutrality of The Portuguese Economy By 2050	20/09/2019թ.

1.1 Legal Status

As already mentioned, the need to have LEDS stems from the requirement of Article 19 (4) of the PA. In particular, the provision stipulates "All Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies, mindful of Article 2 taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances." The " strive to" formulation itself suggests that having LEDS is not a mandatory requirement, but an exhortation, which is fully consistent with the nature and content of this type of document (see previous section). At the same time, the terms of "formulated and communicate" are not legally bounded in terms of both the issuing body and the type of legal act. In other words, we can state that there is no obligation to have LEDS and no restrictions on its legal status. This approach quite logical and it is stipulated in the second paragraph of article cited. In this sense, it is important to learn the respective international experience to understand how to reflect countries' special needs and ambitious in strategic framework.

According to UNFCCC Secretariat records as of 01.10.2019[1], 13 countries have communicated their LEDS with UNFCCC. Among the 14 countries in the Table 1 there is not a record on **Moldova**, which adopted its LEDS by the Government's decision in December 2016. **Ukraine's** LEDS has been approved by the Ukrainian Government's protocol decision, which was preceded by the consent of Inter-ministerial Commission on implementation of UNFCCC (since 1998) chairing by the Ministry of Ecology and Natural Resources. That is, in the cases of these Eastern Partnership countries, governments have approved the LEDS. Yet, we should note that in case of Ukraine, it was a Government protocol decision, which is a bit soft legal act in terms of implementation.

In **USA, Canada, and Mexico** the strategies expressed in the reports, which reportedly went to the UNFCCC Secretariat. They are prepared by the relevant bodies of executive power with active engagement of think tanks, academia, public and private sectors, summarizing also society ambitious on GHG emission reduction targets. Moreover, these three countries have

[1] https://unfccc.int/process/the-paris-agreement/long-term-strategies

developed their reports in close cooperation in the scope of the protocol on North America's climate, clean energy and environment cooperation.

In European region, the picture is different in terms of legislative rules and techniques of law enforcement. For instance, the regulation is quite remarkable in France and the United Kingdom. Particularly, **the United Kingdom** Government approves the "Clean Growth Strategy: Leading the way to low carbon future " document developed by the Department of Business, Energy and Industry, and submits it to the Parliament in accordance with Climate Change Act. **France has** more detailed regulation, according to which the National Low-Emission Strategy is developed by request of respective Law. The latter states the requirements for the content of strategy, as well as the exact dates for submission to the Parliament along with the budget. Moreover, the strategy adopted by the government may be amended in the end of discussions held within the parliamentary committees. Meaning, in France and UK cases, the document seriously considered by the two branches of power and, what is most remarkable is that the decision on having such a strategy is not just the government's initiative. In **German** case, the approach is rather conservative. "Climate Action Plan 2050" document is adopted by the Cabinet, summing up the suggestions from different states of federation, NGOs, municipal authorities and the scientific community. **In Portugal,** this authority is vested in the executive branch, but with one difference that the strategy is adopted by the resolution of the Council of Ministers. The latter is a collegial executive body operating under the Government, which is formed by the first ministers. **Czech Republic's** "Climate Defense Policy" was developed by the Ministry of Environment and is approved by the resolution of Czech Government. The LEDS were approved by the executive body's (government, cabinet) decisions **in Japan, Fiji and the Marshall Islands**.

As a summary we can state:

- Paris Agreement calls on countries to formulate and communicate long-term GHG low emission development strategies.
- Having LEDS is not an obligation, but a global commitment. The legal status of it is not bounded.
- LEDS experience of countries shows that countries communicate their LEDS adopted, approved or declared in any way in accordance with country legal framework. Generally, it is in the mandate of the Government. The differences are mostly in legal control and enforcement mechanisms.

1.2 Sectoral Coverage

As already mentioned, LEDS contains sectoral strategies. In this section, the sectoral coverage of countries LEDS, as well as the main considerations upon which formed the sectoral framework of LEDS are presented.

Overall, sectoral strategies have play important role in development and implementation of LEDS leading realization of strategic goals. The opposite observation is also relevant, namely that a long-term strategy can guide the formulation of sectoral policies.

Many decisions are made at the sectoral level. Sectoral policies and plans help dictate investments and technology choices. They also guide behavioral changes at the local, corporate, and individual levels. Thus, i**t is important to prioritize the sectors that contribute most to the national greenhouse gas inventory and/or are expected to contribute most in the future.**

In their LEDS, countries consider the sectors, inter alia:

- ✓ **by the share of sector in the GHG emissions,**
- ✓ **by the sector 's potential to reduce GHG emissions,**
- ✓ **by the presence of sectoral targets and / or extent of their harmonization with the economic development goals.**

In its long-term strategy, Germany describes the ways in which preexisting sectoral policies—such as the Energiewende, which lays out Germany's energy transition—affected the strategy's development. The strategy draws on targets in the construction sector from the Energy Concept as well as the Climate Action Program 2020. Mexico included the agriculture and livestock sectors, which are key for food security but contribute significantly to greenhouse gas emissions (see the acting LEDS sectoral coverage in Table 2).

Table 2 shows that the observed 14 countries' LEDS have quite similar sectoral coverage, which naturally is defined by the structure of their national GHG inventory. In particular, all of countries cover "Energy generation, Electricity" and "Human settlements, buildings, and infrastructure" sectors.

The energy sector plays a unique and central role in the success of long-term strategies. Energy production and use account for the bulk of current greenhouse gas emissions and potential reductions. The sector is also the potential source of deep greenhouse gas reductions for other energy uses via decarbonized electrification strategies. Energy planning that accounts for the long lifetimes of energy assets increases the likelihood of avoiding technology "lock-in" and stranding assets.

With minor exceptions, the next targeted sectors are transport, agriculture and forestry. The sector of Industry is also widely considered in LEDS. It can be seen that the sectoral coverage mostly depends on structure of country's economy. Rarely considered sectors are Health, water and wetlands.

While describing LEDS it is mentioned that it may include long term vision, development considerations, mitigation and adaptation elements, directions, implementation approaches, monitoring plans and revision processes. From the Armenian LEDS perspective, it is important to reveal the international comparative picture in terms of mitigation and adaptation.

All G20 countries that have submitted their long-term strategies to the UNFCCC include economy-wide quantitative visions for emissions reductions in 2050:

- **Canada** examines an emissions abatement pathway consistent with net greenhouse gas emissions falling by 80 percent in 2050 relative to 2005 levels.
- **France's** strategy includes a target to reduce greenhouse gas emissions by 75 percent by 2050 relative to 1990 levels.
- **Germany** sets a general objective to reduce greenhouse gas emissions by 80–95 percent by 2050 relative to 1990 levels (the strategy is also guided by the principle of "extensive greenhouse gas neutrality in Germany by the middle of the century").
- **Mexico** aims to reduce greenhouse gas emissions by 50 percent by 2050 relative to 2000 levels.
- **The United Kingdom's** Climate Change Act commits the country to reducing greenhouse gas emissions by at least 80 percent by 2050 relative to 1990 levels, through a process of legally binding five-year caps on emissions.
- **The United States'** long-term strategy envisions economy-wide net greenhouse gas emissions reductions of 80 percent or more below 2005 levels by 2050.

These countries also provide detailed descriptions of how they considered the long-term temperature goals of the Paris Agreement, citing various studies to demonstrate how their vision for emission reductions contributes to the global goals

Moldova's LEDS main goal connected with the goals of NDC and aims to reduce net GHG emissions at least by 64% by 2030 compared to 1990. The target may rise to a conventional 78% depending on global agreement on such important issues as low financial resource prices, technology transfers, technical cooperation, and so on. **Ukraine**, staying committed to PA and led by national interest, under ambitious and global arrangement finds it acceptable to reduce GHG emissions by 31-34 % by 2050 compared to 1990.

Canada, France, Germany, the United Kingdom, and the United States touch lightly on adaptation in their long-term strategies, referring to other national adaptation planning documents. All of the strategies recognize the inherent linkages between long-term adaptation and mitigation pathways. **Mexico's** strategy provides a more comprehensive treatment of adaptation. Its strategy is rooted in the vision of building a climate-resilient society while transitioning toward a low-emissions economy. The adaptation section of the strategy is drawn from the National Climate Change Strategy: 10-20-40 Vision, released in 2013. It contains a vulnerability assessment, which led to the identification of three strategic focus areas, with associated lines of action: reducing vulnerability and building social resilience, ecosystem-based adaptation, and protecting strategic infrastructure and production systems. Mexico presents six cross-cutting elements that set the foundation of climate policy for both adaptation and mitigation: interinstitutional collaboration; market-based instruments; innovation, R&D, and technology adoption; building a climate culture; social participation; measurement, reporting, and verification and monitoring and evaluation; and international leadership.

Fiji, despite its NAP adopted in 2017, presents to some extent its adaptation policy and its relation with mitigation elements. The Marshall Islands, having intention to develop a separate NAP by 2020, however presents main principles and directions of adaptation policies. **Czech Republic** "Climate protection policy" complement and simultaneously acts under the adaptation strategy adopted earlier. **Moldova's** LEDS contains reference to adaptation action plan that is going to be developed by the respective Ministry.

Ukraine envisages to develop the adaptation policy as detailed as it has been done for mitigation policy. Table 3 reflects the mitigation and adaptation elements' consideration in the observed countries' LEDS.

Table 2. Sectoral Coverage of the acting LEDS

COUNTRY	TRANSPORT	HUMAN SETTLEMENTS, BUILDINGS, INFRASTRUCTURES	AGRICULTURE, RURAL DEVELOPMENT	FOREST	INDUSTRY, BUSINESS	ENERGY GENERATION, ELECTRICITY	WASTE	HEALTH	WATER	WETLANDS
MEXICO	+	+	+	+	+	+	+			
USA[2]	+	+	+	+	+	+	+			+
GERMANY	+	+	+	+	+	+				
CANADA	+	+	+	+	+	+	+			
BENIN		+	+	+		+		+	+	
FRANCE	+	+	+	+	+	+	+			
MOLDOVA	+	+	+	+	+	+	+			
CZECH REPUBLIC	+	+	+	+	+	+	+			
UK GB	+	+	+	+	+	+	+			+
UKRAINE	+	+	+	+	+	+	+			
MARSHALL ISLANDS	+	+				+	+			
FIJI	+	+	+	+	+	+	+			+
JAPAN	+	+			+	+				
PORTUGAL	+	+	+	+	+	+	+			

[2]ԱՄՆ նախորդ վարչակազմը 2016թ. ՄԱԿ ԿՓԾԿ հաղորդել էր միջինդարյա ռազմավարությունը, որը ներառում էր մոդելավորված սցենարները: Փաստաթուղթը այլևս չի արտացոլում ԱՄՆ քաղաքականությունը

Table 3. Addressing Mitigation and Adaptation in acting LEDS

COUNTRY	MITIGATION	ADAPTATION
MEXICO	✓	✓
USA	✓	○
GERMANY	✓	○
CANADA	✓	○
BENIN	✓	
FRANCE	✓	○
MOLDOVA	✓	○
CZECH	✓	○
UK GB	✓	○
UKRAINE	✓	○
MARSHALL ISLANDS	✓	✓
FIJI	✓	✓
JAPAN	✓	○
PORTUGAL	✓	○

1.3 Implementation Mechanisms

Several G20 countries have experience using long-term plans or visions to inform near and medium-term decisions. At the 19th National Congress of the Communist Party, China announced a two-stage plan to become a "great modern socialist country" by 2050, in two development periods (2020–35 and 2035–50). This long-term vision will inform short-term policy decisions, by, for example, renewing efforts to reduce poverty by 2020. The European Union's 2050 low-carbon economy roadmap, published in 2011, exemplifies another mechanism for establishing near- and medium-term stepping-stones that build toward a long-term vision. The ultimate goal is to reduce emissions by 80 percent between 1990 and 2050. The roadmap sets out cost-effective plans for 40 percent cuts by 2030 and 60 percent cuts by 2040. India translated a longer-term (15-year) vision into a 7-year strategy document and associated sectoral plans. The six G20 countries that have submitted their long-term strategies to the UNFCCC take a variety of approaches to reflecting near- and medium-term decision-making in their strategies:

- **Canada** notes that midcentury objectives will be realized through concrete, short-term action linked to the Pan-Canadian Framework on Clean Growth and Climate Change (a 2030 plan).
- **France** establishes successive four-year periods, with indicative emission reduction targets by sector.
- **Germany** sets 2030 sectoral targets and milestones and actions and notes that programs and measures will be laid out by 2018 to achieve these targets (see Hoven 2018).
- **Mexico** defines milestones for the next 10, 20, and 40 years for society and population, ecosystems, energy, emissions, productive systems, private sector, and mobility.
- **The United Kingdom** sets out plans to meet its carbon budgets out to 2032, with a view to meeting the long-term 2050 target set in the Climate Change Act.

- **The United States** outlined a scenario approach that explores how low greenhouse gas pathways consistent with the long-term vision depend upon strategic investments.

Most of these long-term strategies also explicitly discuss lock-in risks in the context of long-lived infrastructure (e.g., power generation facilities, distributional infrastructure such as pipelines, buildings).

Although LEDS are not usually formulated as action plans, they can guide short- and long-term processes. The extent to which the short-term and medium-term goals are aligned with the goals of the long-term decarbonization depends on the type of policies and plans and the investments required.

3. STRUCTURAL APPROACHES FOR ARMENIA'S LEDS

In this chapter, we present the key approaches and principles which guide the structure of the LEDS. They can also guide the development of the structure of Armenia's LEDS. Some reservations will be suggested later and adjusted in the course of further discussions.

Thus, the LEDS, in general, pursue the following objectives:

- Informing about the short-term and long-term planning and investments, taking into account the climate issues;
- Presenting the low emissions development vision, principles, objectives and main directions of actions;
- Leading the short-term policies and actions on the national, territorial and sectoral levels;
- Identifying the key possibilities for GHG reduction and specifically the sectors, where the emission reduction can be most difficult (for example, when the reduction of GHG emissions requires significant innovations, new policies, additional financing, etc.).

Let's observe the principle considerations by the predetermined structural elements.

The first component is the formulation of the long-term vision.

Long-term Vision

This is the basic component for guiding decisions, identifying policy priorities and ensuring political support. It shall include social-economic development in parallel with the preservation of natural resources and services. In particular, the long-term vision shall include the following elements:

- the time framework of the strategy implementation;
- the long-term final quantitative results of the GHG emissions reduction;
- the sustainable and inclusive development goals: the acceptable movement of the employed population, the creation of decent and high-quality jobs and the reduction of poverty;
- the goals of human and environmental well-being;
- the long-term expectations/results of adaptation and resilience to climate changes;
- the considerations of interconnectivity between the development, adaptation and mitigation;
- the trajectory of achieving the long-term vision;

The next structural component shall express the approaches to the development of the country.

Development Considerations

The LEDS can integrate and express considerations of development which pertain to the environment and social-economic problems that are in accord with the long-term vision of the country.

Integrating and expressing the development goals in the LEDS ensures the involvement of a potentially wider range of goals in the document, thus ensuring a potentially more inclusive transition.

The quantitative identification of the GHG low emissions and resilient development anticipations is a useful means for acquiring political support both on the sectoral and governmental levels to lower down the strategy to the level of the sectoral management.

A modelling exercise can reveal different milestones for reduction of GHG emissions in long-term development goals and the potential of compromises necessary for ensuring the transition.

The development achievements can acquire a quantitative expression in the form of health care, decent jobs, economic growth, poverty reduction, availability of clean energy, reduction of inequality.

Mitigation Elements

Achieving the mitigation goals may demand ambitious national commitments. As a rule, this is the core component of all LEDSs. In general, this component is present in all adopted LEDSs. The long-term quantitative results and goals of emission reduction predetermine the content of the strategy and transitions on the levels of sectors and the whole economy. The exercise allows to understand the ambitious anticipations of emissions reduction and return to identify the mid-term results and obstacles.

Adaptation Elements

Consideration of the adaptation elements in the LEDS allows integrating the resilience to climate change with the priorities of mitigation and development. Article 4 of the PA, by calling the countries to make reports on their strategies, assumes that in spite of being targeted at the mitigation, these strategies will include as well the elements or considerations of adaptation. The Agreement also calls to develop the strategies in Article 2, which includes the goal of expanding «the adaptation to negative climate change and promoting the ability of resilience to climate change» (UN UNFCC 2015). Nevertheless, some countries prefer to include the adaptation elements in their LEDSs. The possible presumptions in this respect can be as follows:

- The goals of enhancing the adaptation abilities, strengthening the resilience and reducing the vulnerability;
- The assessment of the impact of the future climate changes on long-term infrastructures, land usage plans, ecosystem services and/or social changes;
- The description of the impact of no action risks on the ultimate environmental, social, human and economic results;
- The identification of the vulnerable groups and sectors;
- The connection with the national plans of adaptation (if they exist);
- The consideration of synergies between the mitigation and adaptation steps;
- The favorable impact of mitigation actions for the adaptation/resilience and vice versa;
- Consideration of the level of elasticity of the mitigation actions;
- The clear attitude in respect of contingencies of the future climate change;
- The connection with the social development agenda and attempts of reducing the poverty.

There are alternative options for planning the adaptability, including the National Adaptation Programme of Action (NAPAs), the National Adaptation Plans (NAPs), national legislation on climate, plans for achieving the sustainable development goals, sectoral plans and LEDSs. Each of these, or any combination of these, creates a sound basis for planning the adaptability, has enough resources, is inclusive, consistent, transparent and realistic. The government shall also take into consideration the connection between the plans to avoid repetitions, create trust and promote the effective solution of climate change and development problems.

The Government of the RA had launched in June 2016 the National Adaptation Plan (NAP) through consultation with the local beneficiaries and assessment of the existing situation. The program of preliminary actions for implementing a NAP has

been devised and approved by the representatives of the key sectors and the Ministry of Environment The Government of the RA considered the NAP as a key factor for achieving the 2015 INDC goals. Currently, there is no comprehensive system of adaptability in Armenia, although the INDC and National Communications provide the preliminary assessments of the adaptation priorities. In order to fill in this gap, the UNDP Project «National Adaptation Plan (NAP) to advance mid-term and long-term adaptation planning in Armenia «aims at supporting Armenia in developing a climate change NAP which shall have a regular character. That is to say, the processes and strengthening of the core capacities shall be in the focus of attention to provide them with an institutional character for ensuring long-term sustainability.

The next structural components are the Sectoral Guidelines and the implementation mechanisms.

Sectoral Guidelines

The reflection of the sectoral component in the LEDS helps to direct the policies and investments in accord with the long-term perspective and thus save from wasting or not effectively using the resources. The long-term strategies also help to direct the investments on the sectoral level and determine the sectoral targets and required actions. Within the LEDS the sectoral strategies can include:

- **The desired result:** The country can take commitment to achieve this result, which can be, for example, reducing the sectoral GHG emissions to some extent, or producing renewable energy in specific amounts, or raising the energy efficiency to a certain level.
- **Specific policies, measures or actions:** The country can take commitment to implement specific sectoral initiatives, which would be in accord with the LEDS, for example, determine privileged amounts.
- **The horizons of the achievements:** The definition of specific, measurable, achievable, realistic and time-bound (SMART) indicators can help to enhance the accountability of the decision-makers, raise the trust in respect of the process, and its political weight, enhance the vertical integration and cooperation with the policymakers and data collectors, focus attention on the innovative actions for climate change.
- **Transition management option:** The sectoral planning only for the transition may include processes pertinent to the beneficiaries, that are required by the affected communities, mentioning the distribution effects, including the impact on the employment and revenues, and the measures for mitigation of these effects, the definition of effective transition, taking into account the inevitability of both gains and losses in the course of the economic transitions, also the policies and undertakings.
- **R&D and innovation possibilities:** These help to direct the investments both in the public and private sectors.
- **Opportunities13, resources and investment strategies:** The countries can identify the opportunities and resources necessary for sectoral strategies.
- **Considerations in respect of other sectors:** The consideration of other sectors can include the description or the analysis of the crossing sectors, the compromises and priorities.

Implementation Mechanisms

The achievements in the level of emission reduction will not be enough to estimate the progress in the direction of the long-term transitions. The harmonization of the short-term efforts with the long-term development and decarburization goals will highly depend on the way how the emission reduction was achieved in each sector. When developing the implementation mechanisms, it is necessary to take into account the following factors:

- How will the long-term vision direct the short-term and mid-term sectoral and intersectoral decisions, including those decisions which are connected with the mid-

term results (for example, NDC, SDG sectoral programs, etc.).

- The interconnectivity between the current policies and planning and the infrastructural programs and investment plans, as well as the way the LEDS is going to impact the mid-term and long-term economic and development programs of the country.
- The prioritization of measures for the implementation of the LEDS. For example, instead of concentrating on the low-cost but not long-standing solutions, it may be expedient to make investments today in long-term projects, to create a possibility for avoiding emissions tomorrow.
- The institutional regulations and the legal framework for implementing the LEDS;
- Planning the discussions with the partners in the course of implementation;
- The efforts to manage the transition fairly;
- The resources and capacities required for the implementation;
- The roles of not governmental and regional participants in the process of implementation.

The clarification of when and how the implementation program and the required legal initiatives will be developed is an alternative option.

Monitoring Plans and Review Processes

Planning the monitoring and review processes prescribes the way they will be implemented in the phase of implementing the LEDS:

The preferred option is the one when the document development process includes as well the monitoring plan. The institutional commitments and processes must be prescribed in a way to give clear instructions on what, when, who and how will do the monitoring. To have an understanding of productivity of the made efforts and the dynamics of the key indicators it is necessary to devise sectoral indicators. It is necessary to estimate the progress regularly with consistent approaches. In particular, the monitoring plan can include the following:

- the institutional role, including the institutes responsible for collecting and processing information;
- the information or indicators in consideration, as well as the information sources;
- the frequency of making the monitoring;
- the methods of collecting and analyzing the information.

Reviewing, based on the result of the monitoring, will allow assessing whether the strategy has adopted an innovative direction and is forming capacities and preserving the priorities. On the other hand, the assumptions based on modelling can change in the years (for example, based on new information on technologies or their prices). The accessibility to information can be enhanced and the results of modelling can be adjusted, which can reveal new directions of adaptation. The process of reviewing can create additional possibilities from the point of view of involving new participants and partners.

LEDS can present the framework of the reviewing process by involving, in particular, the following:

- the tasks and principles of reviewing, with the indication of which components are to be reviewed;
- the ministries or bodies responsible for reviewing;
- the frequency of reviewing;
- the methods of reviewing;
- the resources necessary for reviewing and their sources;
- the connection with other local and global processes.

Considerations and alternatives of the structure of the LEDS when making a decision on the structure and content.

When reflecting on the LEDS structure and content framework and making decisions, usually there is a need to contemplate on certain mutual concessions and alternative decisions, like the following ones.

- **Mutual concessions between the comprehensiveness and manageability.** The realistic presumption is that the depth and scope of the document shall be in accord with the national priorities, as well as the involvement, capacities and resources.
- **Mutual concessions between the choice of the questions to be discussed in this document and other questions that will be considered more comprehensively in other documents.** For example. the inclusion of the adaptability elements can help in assessing the impact of the low GHG emissions on long-term developments. Instead, the country can direct the limited resources towards developing separate adaptation plans and not towards integrating into the document. Taking into account the long-term vision, as well as the assumed applicability of the strategy will help in determining the starting scope of the document.
- **Mutual concessions between the urgency of developing a LEDS and the scope of its comprehensiveness.** The processes of strategic planning, regardless of the content requirements are often forced to adapt to the logic of political cycles and/ or depend on the available resources and capacities.
- **Wide framework of participants.** The PA called to the countries to report their LEDS by 2020. The adjacent processes of developing policies can serve as quick access to additional support.

II. THE STATE POLICIES, SECTORAL STRATEGIES AND ANALYTICAL WORKS

In this section, we present the current strategic documents on the main sectors under the green-house gas cadaster of Armenia, as well as the available data from the performed research. We present as well the framework strategic documents, which, as a rule, come from and/or are developed in accordance with the sectoral policies. Namely,

The Perspective Development Strategic Program of the RA, for 2014-2025 (2014). The program prescribed the social-economic development priorities of the country, goals, key reforms and policy directions necessary for reaching the priority goals.

The 2009-2023 Program of the Government of the RA (2019). The program makes a clear emphasis on the development of the renewable energy and energy-efficient systems, for mitigation and prevention of problems resulting from the climate change, as well as the implementation of adaptation actions under the commitments taken through the international agreements, the development and implementation of a sustainable policy for promoting green economy and achieving long-term sustainable development goals:

It is defined that the main problem of management of the environment protection is to minimize the negative impacts on the environment, air, climate, water, soil, flora and fauna, exclude the overly and illegal exploitation of natural resources, provide the implementation of preventive measures. Concurrently, the Government policy in the sphere of energy will be directed at securing the country's energy independence and raising the energy security, providing integration into the processes of regional development, sustainable development of energy industry, based on the legal and effective use of the local primary (renewable) energy resources, further development of nuclear energy, diversification of the fuel supplies and implementation of energy-efficient and new technologies.

New Projects

The Economic Revolution Strategy of New Armenia, 2020-2050. The Project defines 19 mega-objectives proceeding from the common vision, including:

- the 9th mega-objective **«Productive and Responsible Farming»** which assumes sustainably developing, innovative, added value multiplying, caring for natural resources farming, which ensures food security and sufficiency.
- the 15th mega-objective **«Renewable and Available Energy»** presumes to provide Armenia with energy security and self-sufficiency, sustainable availability and accessibility of harmless for the environment electric power.
- the 17th mega-objective **«Clean and Green Armenia»**, addresses the widespread responsible and caring attitude of the public to the environment, effective prevention of the ecological and climate risks.

ENERGY SECTOR (the specific weight in the total GHG emissions is 67%)

Within the sector - from electric power production - 23%, from the road traffic - 23%, natural gas leak emissions - 22%, housing sector - 15%, industry and construction - 9%.

The Energy Law of the RA, 2011. The law is the main legal document regulating sphere which defines the state policy principles in the sphere of energy and the mechanisms of their implementation. The principles include «the encouragement …of scientific-technical progress and new energy-efficient and energy-saving technological investment». The amendments made in the law in 2014 created favorable conditions for renewable sources of energy by defining the provision of the twenty years (instead of the previously acting fifteen years) mandatory purchase of the whole produced electric power (except the small HPPs). And in 2016 the changes created favorable conditions for the production of up to 150 KVt (inclusively) solar energy power plants by defining that electric power can be produced without a permit or license given by the corresponding Committee.

The Concept of Ensuring the Energy Efficiency of the RA, 2013. The Concept approved by the order of the President of the Republic of Armenia among the main ways of providing energy efficiency prescribes the effective use of renewable energy resources, the development of nuclear power, and stipulates a clear vision and a range of measures for its implementation. By the order of the President of the RA, the Government confirmed the Decision N836-N, on July 31, 2014, which is ensures the implementation of the Program of Measures for 2014-2020 for the accomplishment of the **Concept of Ensuring the Energy Efficiency of the RA,** by prescribing concrete actions, including such for the accomplishment of the goals of energy-efficiency and development of the renewable energy production.

The long-term energy sector development strategic document **«Energy sector development strategy of the Republic of Armenia in the context of the economic development»,** adopted by the session decision of the Government of the RA of June 23, 2005 (the target horizon by 2025), by which the strategic directions of the energy sector development include the use of the renewable energy resources and energy efficiency, as well as the nuclear power, for ensuring the necessary level of energy security and independence. The document defines as well the actions for ensuring the achievement of the goals and initiatives of the program.

On December 10, 2015, the session decision of the Government of the RA, N 54 approved the document «**The Directions of Long-term Development of the Energy Sector of Armenia (by 2036)»** which is targeted at ensuring the sustainable development of the energy sector based on the development of the nuclear energy, effective use of the renewable resources, construction of combined cycle TPPs and diversification of the fuel importation ways. Currently, the energy development strategy of the country is being reviewed to integrate a more ambitious development vision for the sources of renewable energy, diversification of the fuel supply chains and regional cooperation and integration programs.

On December 22, 2011, the Government of the RA approved by Session Decision N 50 the **«Concept of Ensuring the Energy Security of the Republic of Armenia»**, which has qualified the task of creating an attractive for investment environment as a concept problem, including both the renewable and alternative sources of energy and the nuclear power sector, provision of energy-efficiency and energy-saving.

The Law of the RA «On Energy efficiency and Renewable Energy» adopted on November 9, 2004, is the main legal document governing the sphere and is regulating the interrelations of the state and local self-governing bodies of the Republic of Armenia, legal and physical entities proceeding from the activities in the sphere of energy-saving and renewable energy production. **The amendments made in the Law in 2016** have created favorable conditions for the development of business production of solar electric power, by defining the order of interconnection between an independent solar energy producer and the entity owning an electric power distribution license. They also defined the provision of mandatory technical requirements of energy-saving and energy-efficiency in newly constructed multi-apartment buildings, as well as constructions newly built (reconstructed or renovated) by the financing of the state budget.

By the demand of the Law the session decision of the Government of the RA of January 18, 2007, N2, approved the **«National Program of Energy-saving and Energy-efficiency of the Republic of Armenia»**, which targets the period of 2007-2020 for the assessment and realization forecasts of the energy-savings and renewable energy potential of Armenia. The program has been implemented by a) **«The Action Plan of the Republic of Armenia for the Implementation of the National Program on Energy-saving and Energy-efficiency** approved by the session decision of the Government of the RA N43 of November 4, 2010, including the period of 2011-2013, and b) the session decision of the Government of the RA N4 of February 2, 2017, that has approved the document **«Second Phase of the Energy-efficiency Action Plan of 2017-2018 of the Republic of Armenia».**

The Concept of Developing Hydro-energy in the RA, 2016, prescribes the vision of the Government of the RA for the development of the sphere of hydro-energy, making the investment environment more attractive, the need for implementing options of public-private sector cooperation and providing certain legal guarantees. It was adopted by session decision of the Government of the RA N 53 in 2016.

New Projects

The Action Plan of Initiatives of the Government of the RA of 2019-2023 stipulates to develop a range of strategic documents within the coming 5 months, namely:

- **In 2019** – the long-term development directions of the energy system of the RA for devising the energy system development directions in 2020-2040;
- **In 2021** – the new perspective development plan of the electric energy system of Armenia, and the initiatives for the development of the sector in the next decade.
- **In 2021** – The national program of energy-saving and energy-efficiency of the Republic of Armenia for 2021-2030, for devising new branch initiatives and targets, which will support the further development of energy-saving policy and identification of concrete steps for its implementation.

- ✓ **Armenia: Energy Efficiency Project – Independent Evaluation, WBG, 2019;**
- ✓ **Least-Cost Energy Development Plan for Armenia's Energy Sector in 2020 – 2036. Market Liberalization and Electricity Trading Program, USAID, 2019.**
- ✓ **Analysis of Energy Efficiency Gaps in Armenia, LDK Consultants, 2019.**
- ✓ **Inventory of Energy Subsidies in the EU's Eastern Partnership Countries, OECD, 2018.**
- ✓ **Acceleration of Development and Adoption of Energy Labelling and Minimum Energy Performance Requirements for Energy-consuming Products in Armenia (EU4 Energy), International Energy Charter, 2017.**
- ✓ **Comprehensive Analysis of Armenia's National Policy in the Sphere of Energy-efficiency , International Energy Charter, 2017.**
- ✓ **Support for Enhancing the National and Territorial Energy Planning and Capacities in Armenia, Energy Research Institute, USAID, 2017.**
- ✓ **How are defined the GHG mitigation priorities: Armenia's and Georgia's apartment building sector marginal price decrease curve, WBG, 2016.**
- ✓ **Climate Change Actions Financing in Armenia, Country Study, OECD, 2016.**
- ✓ **Least-Cost Development Program of Armenia's Energy Sector, USAID, 2015.**
- ✓ **Armenia: Low Carbon Development Pathways, Opportunities for Developing Countries, WB, 2015.**
- ✓ **Sustainable Energy Pathways in the South Caucasus: Development Opportunities and Policy Choices, Heinrich Boell Foundation South Caucasus Regional Office, 2015.**
- ✓ **Armenia – Power Sector Policy Note, WBG, 2014.**
- ✓ **Report on Renewable Energy Development in Armenia, ARREEF, 2011.**
- ✓ **Assessment of the Wind Power Potential of Armenia, USAID, 2010.**

AGRICULTURE, FORESTRY AND OTHER LAND USE
(specific weight in the total GHG emissions is 19.6%)

Within the sector - Cattle breeding (intestinal fermentation, manure processing) - 71.43%, emissions from managed lands - 28.55%

Sustainable Villages and Agriculture Development Strategy of the Republic of Armenia, 2010-2020, confirmed by the Government of the RA on November 4, 2010, by Decision N1476 – N, prescribes the main directions of agrarian policy and the measures ensuring their implementation. The range of the main objectives of the policy includes the development of cattle-breeding, with stipulation of productive combination of the branches of cattle-breeding and rational distribution of support, development of the

breeding stock, implementation of complex measures for stock reproduction, enhancement of the veterinary system, increasing the effectiveness of veterinary measures, development of the forage base for cattle-breeding, creating small plants for the production of concentrated stock forage in provinces, supporting the cattle-breeding commercial organizations, ensuring the protection of genetic diversity of the animal pedigree.

Development of cattle-breeding in the Republic of Armenia in 2019-2024, approved by the Government of Armenia on March 29, 2019, by Decision N 327 – L, to support the economic entities involved in breeding cattle in the RA, by loans with partial subsidization of the interests for pedigree stock purchase, which will allow to replenish the cattle herd-stock with economically valuable cattle pedigrees instead of the old, unproductive and unknown pedigree animals, develop the cattle-breeding business, improve the productivity of the dairy and meat production, decrease the cost of the produced milk and meat as compared with the imported products and make the local production more competitive.

State Support Program to Sheep-breeding and Goat-breeding in the Republic of Armenia, 2019-2023, approved by the Decision of the Government of the RA N 1305-L of September 19, 2019, with the goal of to provide state support mechanisms, in particular through accessible loan terms and cost compensation, for creating favourable conditions for sheep-breeding and goat-breeding in the Republic, for the purchase of commercially valuable sheep and goat pedigrees, formation of productive herd-stocks, improvement of the breeder stock, development of the small cattle breeding business, increase of production and export of small cattle stock products.

The Forest Code of the Republic of Armenia, adopted on October 24, 2005, is the main legal document for regulating the sphere and is regulating the sustainable management of forests and forest lands of the RA for protection, preservation, recreation, development and productive use, as well as calculation, monitoring, control and relations connected with the forest lands.

The National Forest Program of the Republic of Armenia, adopted on July 21, 2005, by the Government Decision N1232-N, commissions to plan and implement actions directed at the sustainable management of forests and forest lands of the Republic of Armenia, consistent with the national forest policy and strategy.

New Projects

The Program of Activities and Initiatives of the Government of the RA for 2019-2023, stipulates the development of several strategic documents in the course of the coming 5 years, namely:

- **in 2019** – the sustainable development strategy of the Agriculture of the RA with the vision of 2029;
- **in 2019** – the draft of the Law of the RA «On making changes and amendments in the Forest Code of the Republic of Armenia».

Research and Analysis

- ✓ **Sustainable, Inclusive Agricultural Sector Growth in Armenia, Lessons Learned of the Growth and Reduction Recent Experience, WBG, 2017.**
- ✓ **Gender, Agriculture and Rural Development in Armenia, FAO UN, 2017.**
- ✓ **The Modernization and Commercialization of Agriculture in Armenia, WBG, 2016.**
- ✓ **Reducing the Climate Change Vulnerability of Armenia's Agriculture, WBG, 2014.**
- ✓ **Building Resilience to Climate Change in South Caucasus Agriculture, WBG, 2014.**
- ✓ **Armenia - Climate Change and Agriculture, Country Note, WB, 2012.**

INDUSTRIAL PROCESSES AND PRODUCT USE
(specific weight in the total GHG emissions is 7.5%)

Within the sector – From mining industry (mainly from the production of cement and inductrial clinker) - 31.1%, from materials destroying the ozone layer (mainly from refrigeration systems) - 68%

The Export Oriented Industrial Policy of Armenia was approved by the Government of the RA by the session decision N 49 of December 15, 2011. The document defines the main problems of the construction material production industry, the high cost of communication and the limitations of trade on the regional level. At the same time, the document prescribes the main directions of support to the sphere, provision of availability of markets and development of exportation capacities.

The Concept of Mining Industry Development, that was approved by the session decision of the Government of the RA, N 36 of August 24, 2017, is aimed at supporting the sustainable development of the sphere by revealing the current issues, as a basis for devising the mining industry development policy and strategy.

New Projects

The Program of Measures of the Government of the RA for 2019-2023 stipulates development of a number of documents in the course of the coming 5 years, namely:

- **in 2019** - the Industrial Policy Strategy and Program of Measures
- **in 2019** – The Mining Iindustry Strategy.

Research and Analysis

- ✓ **Global CO2 Emissions from Cement Production, 1928-2018, R. Andrew, 2019**
- ✓ **Comprehensive Study of Manufacturing Industry of Armenia, Avenue Consulting, 2016**
- ✓ **Armenia - Strategic mineral sector sustainability assessment, WBG, 2016**
- ✓ **Armenia - Export-led industrial development strategy: implementation review and recommendations on new toolset, WBG, 2015**
- ✓ **Armenia: Sustainable and Strategic Decision Making in Mining, WBG, 2013**
- ✓ **Fostering entrepreneurship in Armenia, WBG, 2013**

WASTE MANAGEMENT
(specific weight within the total GHG emissions is 5.85%)

Within the sector – Household solid waste decomposition - 66.78%, wastewater recycling - 29.78%

The Strategy of household solid waste management system building for 2017-2036 for the Republic of Armenia. The document was approved by the session decision N49 of the Government of Armenia of December 8, 2016. The priority goal of the strategy is to create a solid waste management integrated system meeting the EU standards, which will provide cost-efficient, technically, financially and environmentally sustainable services to subscribers.

The Concept of Implementing Systems for Raising the Responsibility of Manufacturers (Importers) for Certain Types of Goods and Products. This document was approved by the session decision of the Government of the RA, N 15 of April 13, 2017. It is assumed that the implementation of the concept will allow Armenia to

implement a «Reasonable System of Recycling the Out-of-use Goods and Products Harming the Environment«.

The purpose of devising the document for the definition of «The Rules of the Use of Sewerage Sanitation and Waste-water Cleaning Systems « which was approved by the Decision of the Government of the RA, N1228-N of August 28, 2003, is to provide a decent level of management and usage (maintenance) of the sewerage and waste-water sanitation and recycling systems, with correct organization of the cleaning and recycling structural facilities, creating conditions for raising the productivity level of their operation and the organization of the laboratory-operational and technological control over their operation.

New Projects

The Program of Activities of the RA for 2019-2023 stipulates to develop a number of strategic documents in the course of the next 5 years, namely:

- **in 2019 –** Waste collection system strategy.

Research and Analysis

- ✓ **Reforming Sanitation in Armenia, OECD, 2017**
- ✓ **Qualitative Analysis of MSW in Armenia, Croatia, Cyprus, F.Y.R.O.M. and Ukraine, T.Lolos, 2016**
- ✓ **Armenia - Water sector tariff study, WBG, 2015**
- ✓ **Recycling of Household Waste in Armenia, FEAG, 2011**
- ✓ **Armenia - Water Sector Note, WB, 2011**

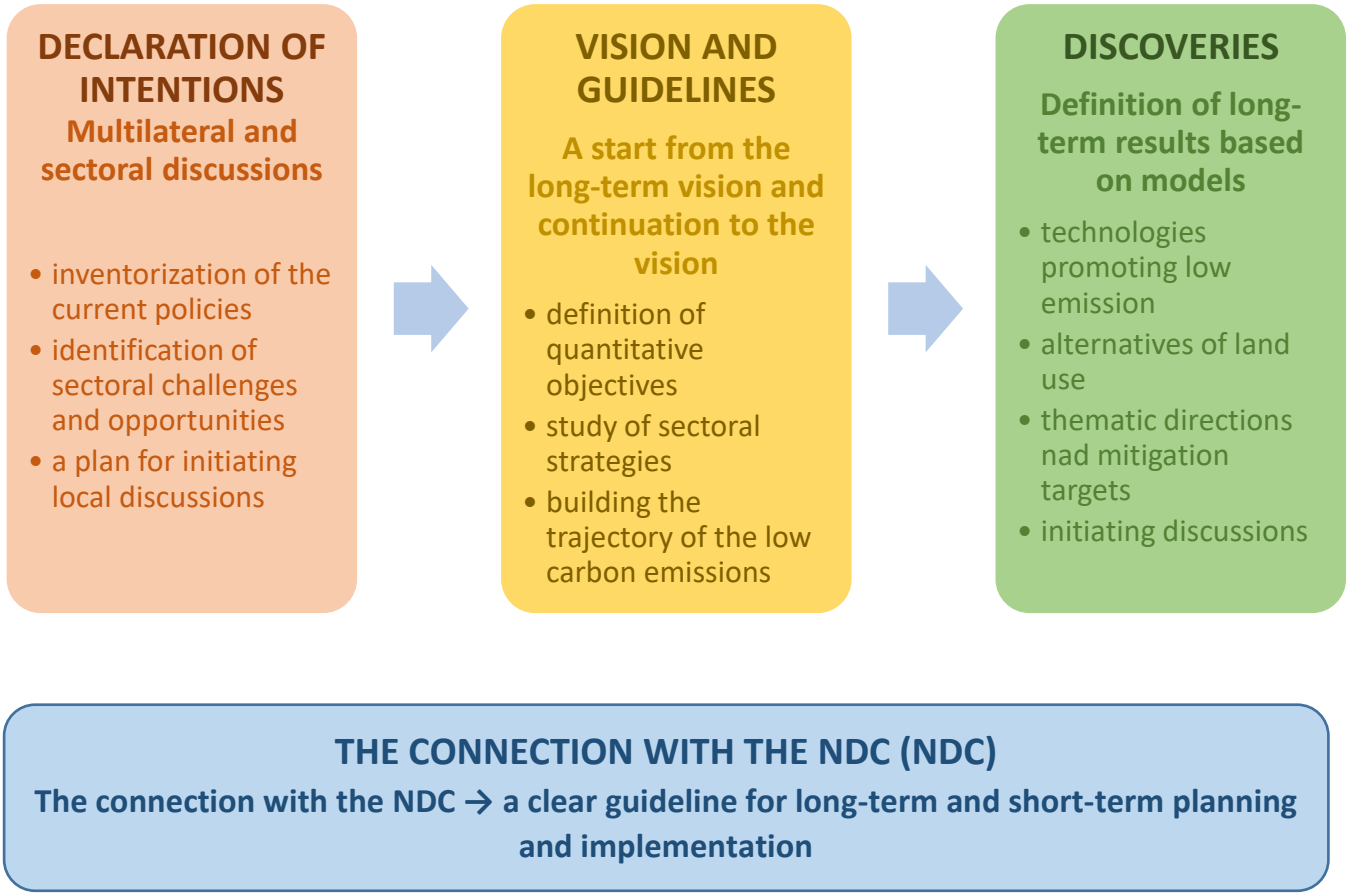
4. INITIATING ARMENIA'S LEDS DEVELOPMENT PROCESS

The study of the international experience and the discussion of the methodological considerations, presented in the previous chapters of this text are generally guiding the understanding of the implementation process for developing a LEDS in Armenia. The process includes a range of activities that shall be implemented by a phase-by-phase approach and launched in conditions of possibly wider inclusive participation (Figure 1).

The range of activities of the first phase, the productive launch of which will demand a strong political will shall consolidate the potential partners, policy-makers and beneficiaries. In order to make this come true, we suggest to submit the current document to the Office of the Prime Minister of the RA or the Office of the Deputy Prime Minister of the RA and with the recommendation of the latter also to the main partner government bodies (the list is attached below), anticipating a preliminary, specifically united understanding of the topic and the recommendation of responsible doers, who will be correspondingly involved in four sectoral working groups. The three sectoral groups will work in the sub-branches of energy industry, and one sectoral group in the sphere of agriculture.

The next phases of the sectoral group-work shall involve the research facilities and professional structures to discuss the results of quantitative estimates and scenario analysis. The outcomes will be regularly reported to the Prime Minister of the RA and the corresponding platforms of climate change discussion and/or coordination of the strategic planning.

Figure 1. The phases for developing a LEDS.



5. Main Partners

As stated earlier, the processes for the development and implementation of a LEDS assume the active participation of a wide circle of partners. The partner structures shall represent the public and private sectors, political and civil society institutions, each of them within their authorized mandate and the role reserved within the framework of this process.

Concurrently, it is assumed that the ministries will be the linking chain that will facilitate the involvement of representative of the private sector operating in the corresponding fields of activity, also the unions, associations and social structures representing their interests, and the research institutions. Thus, the main partner structures in the public sector are listed below.

The Ministry of Environment of the RA, as the public body devising and implementing the Government policy in the spheres of preventing or mitigating the negative impact on atmosphere, water resources, soil, forests and specially protected natural territories, solving the climate change problems, including the adaptability, arranging the performance of the monitoring of sustainable management of the specially protected natural territories, forests and the environment, the special and regular observations of the hydro meteorological phenomena, studies and forecasts, and the coordination of the work of actively influencing the atmospheric phenomena.

The Ministry of Territorial Management and Infrastructures of the RA, as the public body devising and implementing the Government policy in the spheres of territorial and infrastructural management, energy, security in the spheres of nuclear energy, renewable energy and energy consumption, supporting the development of the energy independence of Armenia, energy-saving and energy-efficiency, managing the water resource systems.

The Ministry of Economy of the RA, as the public body devising and implementing the Government policy in the spheres of different branches of the economy, including raising the industrial competitiveness, the productivity of cattle-breeding, agricultural food, and public support to the development of the agriculture.

6. Definition of Goals and Objectives of Armenia's LEDS

While discussing the structural components, we mentioned that the quantitative definitions connected with the anticipations of the development of GHG low emissions and resilience, in the form of objectives and tasks, is the best way for transferring the strategy to the sectoral level. Concurrently, the LEDS can integrate also the development goals and tasks that are in accord with the long-term development vision of the country. The sectoral guidelines of GHG emissions for long-term development goals and the identification of the potential for implementing the transition will be accomplished through professional discussions and modelling exercises in the 2nd and 3rd phases of developing the LEDS, as shown in Figure 1. The planned sectoral working groups will discuss the results of the work accomplished by the professional circle and will arrange also public discussions.

In different phases of accomplishment and addressing different sectors of development, these processes will be supported by the programs implemented by different development partners of the Government of the RA, in particular, the UNDP, by mutually supplementing each other and providing the maximum synergic results, namely:

The Third Biennial Update Report of Armenia, (BUR), GEF Trust Fund, UNDP. The BUR3 will support the further improvement and strengthening of the reporting process. The work on improving the quality of the management of the GHG cadaster will result in replenishing the missing data, improvement of the analysis of the main categories and assessing the contingencies, will support the process of data collection, compilation and verification for the preparation of the GHG national cadaster and the development of institutional mechanisms and will reduce the time required for data collection. The reports in respect of the mitigation made in the framework of the BUR3 will include the assessment of the progress of 2015-2018 policies and actions implemented in the country, as well as they will

assess the energy sphere mitigation scenarios by 2030. For correcting some shortcomings existing in the country in the sphere of developing climate change directed policies, and based on the results and lessons of the process of developing the national program will be officially devised the requirements for the internal monitoring, reporting and inspection model of mitigation arrangements, including the pertinent support.

The National Adaptation Plan (NAP) for planning the progress of mid-term and long-term adaptation in Armenia, Green Climate Fund, UNDP. The program is aimed at supporting the development of Armenia's climate change NAP, keeping in the focus of attention the strengthening of the core capacities. The goal of the program is to eliminate the existing obstacles and support the identification of investment priorities in the prevalent six spheres of the climate change adaptability and increase the accessibility of financial resources to implement the urgent actions stipulated by this program. Along with the development of the NAP process, the basis of systemic and regular updating of specific actions supporting the identification of the mid-term and long-term risks, the climate change adaptability priorities, and the climate change adapted sustainable growth. Concurrently, in the framework of adaptation of the sustainable growth goals, the NAP process will support building the corresponding targets responding to climate change.

«EU for Climate», EU-UNDP Regional Program. The goal of the program is to support the development and implementation of climate policies by the East Partnership countries, which fosters the low emissions and climate change resilient development and meeting the commitments taken by the Paris Agreement. The current document was prepared under this program, for guiding and leading the LEDS development process. In this respect the Program will do the following:

- arrange the sectoral working groups and will coordinate their work;
- devise the LEDS development action plan;
- develop the methodological guidebook;
- involve corresponding experts, who together with the sectoral working groups will provide the sectoral research;
- arrange discussions, conferences, round-table meetings;
- provide the connection with other programs, namely, in respect of sharing information, knowledge, results of studies and analysis;
- implement the process necessary for the final modelling of the LEDS project.

III. EMISSIONS REDUCTION POLICY INSTRUMENTS AND THEIR IDENTIFICATION IN THE ENERGY AND AGRICULTURAL SECTORS OF ARMENIA

Based on the studies conducted within the framework of the “EU4Climate” regional climate program and the brief overview developed on their basis, it has been identified that while setting priorities in the context of the Low Emission Development Strategy (LEDS) it is important to target those sectors which are pivotal in the national greenhouse gas (GHG) inventory or may become so in the near future. At the same time, in addition to the volume of GHG emissions, the sectors are also addressed in view of their potential for GHG emission reductions and existence of sectoral targets and/or harmonization with economic development issues. In this regard, the report addresses the energy and agricultural sectors. Additionally, considering the phased nature of LEDS development, the report will focus on the study and inventory of the policies in the said two sectors, identification of sectoral challenges and opportunities in terms of integrating regulations implicating low carbon practices.

Article 4 of the Paris Agreement, while calling on states to report their strategic commitments, assumes that, despite targeting mitigation, they are also required to include adaptation elements or considerations. However, considering that Armenia is expected to present a separate national adaptation plan in 2020, the energy and agricultural policies in this document will be

considered predominantly from the mitigation perspective.

Thus, the "Long-term (up to 2036) development directions of the RA energy system" document approved by the Government Decree N 54 of the December 10 2015, is currently being revised to reflect more ambitious development goals for renewable energy sources, deeper diversification of fuel supply chains and regional co-operation and integration projects. This will serve as the basis for the new National Energy Efficiency and Renewable Energy Program of the Republic of Armenia for 2021-2030, which is the direct focus of interest for this paper. Therefore, the current draft of the first paper will be deliberated by expert assessment, and recommendations will be made in relation to the draft National Energy Efficiency and Renewable Energy Program.

In the field of agriculture, the subject of study will be "The 2020-2030 strategy on main directions ensuring economic development of the RA agricultural sector". Furthermore, considering that livestock breeding segment accounts for the major share of the emissions attributable to agricultural sector (53.1% constitute methane emissions from the intestinal fermentation of agricultural livestock), Armenia's 2019-2024 livestock development program will also be included in the scope of analysis.

7. MITIGATION STRATEGIES IN THE ENERGY SECTOR

For identifying GHG emission reduction policies and adequate mitigation tools in the Armenian energy sector, proper methodological approach is required. To address this issue within the framework of this section, two frameworks of mitigation policies in the energy sector are used: the policy framework addressing OECD countries and the strategic framework formed for EU countries.

7.1 OECD policy framework

Decarbonization of electricity is a prerequisite for the transition to a low-emission economy. Over the first two decades of the 2000s, OECD countries passed through this phase by means of the application of **climate policies, non-climate policies** and **socio-economic factors**[3]. It is important to emphasize that the implementation of one of the factors in isolation does not produce the expected results in terms of speed as well as quality.

Instruments envisaged under these policy frameworks were assessed according to significance of their impact. However, in addition to the final outcomes, all the hypotheses considered will be presented below (they are based on the results of various studies previously conducted), given the fact that typically an instrument is often adopted and / or considered based on its appearance of effectiveness at first glance, which however it is not substantially justified empirically. At the same time, it can also facilitate the process of political decision-making by providing comprehensive understanding of the adherent cost implications.

CLIMATE POLICIES

Various incentives such as carbon prices or targeted support for renewable energy are essential for decarbonization of electricity. These policies are relevant from the point of view of market failures and contribute to accelerating reduction of emissions. This trend it maintained even in the face of rapid decline in wind and solar energy prices. GHG emissions can be estimated directly through emissions trading or carbon tax mechanisms, and indirectly - by subsidizing emissions reduction activities, such as feed-in tariffs or

[3] Power struggle: Decarbonizing the electricity sector, OECD Environment Working Papers No. 139, 22 November, 2018

renewable energy quotas. Thus, in order to identify effective mitigation tools, the following hypotheses have been formulated, which, as mentioned already, are based on various analytical studies.

Higher carbon prices presumably contribute to decarbonization. This becomes possible as it triggers changes in technology, in the behaviors of exporters and consumers, as well as innovations. As prices for emissions rise, utilities eventually opt for abandoning the use technologies that generate higher levels of emissions. Consumers also respond to increase in prices by consuming less electricity. Carbon prices can also stimulate private investment in new generation technologies, as it improves renewable energy risk/reward performance. New investments also lead to the expansion of deployed renewable capacities, the expansion of their application and eventually to reduced emissions. Consequently, decarbonization is increasing as emissions prices rise.

The longer horizon of carbon price planning presumably contributes to decarbonization. An additional characteristic of carbon pricing is the distinct and persistent nature of perception of this policy. If an investor believes that the price of carbon is subject to change, there is virtually no incentive for any beneficiary to respond and adjust behavior, especially when that adjustment brings about a higher price or substantial shifts from accepted practices. Conversely, prices defined for a longer horizon indicate the government's commitment to fostering mitigation and low carbon footprint. The planning timespan is determined by the carbon prices, which are effective for the years remaining before the revision time spot envisaged by legislation. Thus, decarbonization is expected to increase with the expansion of the carbon price-planning horizon.

Public tenders presumably contribute to decarbonization. The public procurement policy aims to promote public and private engagement in the procurement processes. Consequently, government tenders that increase capacities of renewable energy are likely to stimulate investment in relevant technologies, leading to enhanced innovations. It should encourage the expansion and use of renewable power and upsurge the potential for emissions reductions. In this context, it is presumed that government tenders for renewable power may contribute to decarbonization.

Higher feed-in tariffs (FIT) and longer contract lengths are likely to contribute to decarbonization. FITs are widely used incentives for transitioning from the use of fossil fuels for electricity generation to the use of renewable resources, as an obvious complement and alternative to carbon pricing. In theory, FITs are accelerating the growth of renewable energy by serving as guarantee for renewable energy producers' long-term contracts. In practice, this interconnection does not always necessarily have a tangible effect on investor expectations regarding the investment recovery timeline or size of the investments. The latter determines the investors' attitude towards the level of FITs. Therefore, it is highly probable that the decarbonization increases in the context of increased level of FITs and prolonged FIT contract terms.

Renewable energy quotas presumably contribute to decarbonization: REQs, or in other words, renewable energy credits, are emerging as a market alternative to FITs. REQs, within the framework of the quota, provide economic incentives to increase efficiency for utilities. These are expected to drive investment and innovation in various renewable energy technologies. However, as with FITs, the effectiveness of REQs in practice is not unequivocal. It may be assumed that REQs can promote innovations in technologies that are close in competition with fossil fuels, while this

may not be the case with more expensive technologies such as solar energy.

NON-CLIMATE POLICIES

Decarbonization may accelerate or fail as a result of ongoing non-climate policies that persist in promoting or restricting the use of fossil fuels and other carbon activities. Under non-climate policies, the scope of analysis included subsidies for fossil fuels, public RDIs (research, development, investment) in the areas of renewable sources and fuels, Basel III financial regulations.

Fossil fuel subsidies presumably inhibit decarbonization: These subsidies are "perpetuating" the use of fossil fuels by distorting prices and decisions on resource allocation. Given that the establishment of renewable energy infrastructures requires additional capital investment, these subsidies contribute the continued use of fossil fuels. Hence, elimination of subsidies will make the prices of renewable technologies more competitive. Moreover, the subsidies for fossil fuels contribute to the growth of innovations and investments in this area, ensuring their further development.

Public RD&D in fossil fuel presumably inhibit decarbonization: RDIs (with the exception of those in the area of carbon capture and storage) are a type of subsidy that perpetuate the use of fossil fuels and demonstrate lack of government commitment towards low carbon footprint. At the same time, these costs are incurred in lieu of potential investment in renewable technologies, which consequently downturns their development.

Public RD&D in renewable fuels increase decarbonization: These RDIs can accelerate the introduction of renewable technologies and testify to the government's commitment to a low carbon footprint. Despite the enormous resources invested, the development of renewable energy technologies is a long-winded process in terms of return on investment and administrative barriers. However, in theory, RDIs stimulate innovation and increase the competitiveness of renewable technologies.

Basel III leverage ratio (leverage ratio) inhibits decarbonization. Basel III aims to limit the excessive leverage and influence of banks. Such regulations exist to enhance the overall stability of the financial system, which is a prerequisite for any investment, including for decarbonization of electricity. Capital and liquidity requirements set by the regulations may act as inhibiting factors for the long-term financing required for renewable investments.

POLITICAL ECONOMY

Policy makers are required to constantly balance all interests involved, including those of public, stakeholder groups, political parties, whose support is viewed as a prerequisite for successful reform processes. Political variables include the interests of key players in electricity decarbonization. 1) producers (age of inactive/idle assets and market concentration), 2) state (state-ownership in power sector, employment), 3) consumers (public environmental concerns). It is important to keep in mind that these factors may also carry an indirect impact of on decarbonization, as they are likely to affect climate and non-climate policies.

State-owned enterprises in the electricity sector may foster as well as inhibit decarbonization. State-owned enterprises are likely to encourage or disrupt the government's efforts towards electricity decarbonization. They often receive preferential treatment, which may be beneficial for decarbonization, as state-owned enterprises may be motivated not only by financial returns but also by social and environmental objectives, such as decarbonization. Preferential treatment is likely to create opportunities for cheaper renewable sources. However, in practice the predominant trend is the opposite, which gives way to uncertainty in making conclusions. The impact of SoEs on climate and non-climate policies is also vague, as their support may be in favor as well as in opposite to decarbonization.

Market concentration presumably suppresses decarbonization. Market concentration can have a restraining impact by limiting startups' entry to the electricity market and thereby reducing investment in renewable sources. Such startups also appear to be on unequal footing in terms of competition, as compared to fossil fuel.

On average long useful lives of power plants presumably increases decarbonization. Infrastructures in the energy sector are characterized by relatively long useful lives. The transition to a low-carbon economy alongside with existing fossil-fueled plants will lead to their write-off earlier than the allowed period of useful life, which suggests that these assets will be depreciated or prematurely converted into liabilities. Consequently, the higher average time in use of the stations implies a smaller number of passive assets, which means that decarbonization will be less costly.

The number of jobs in the fossil fuel industry presumably suppresses decarbonization. Steady employment is the next impediment in line for decarbonization in this as well as other related sectors. Decarbonization will cause structural shifts in employment, which in its turn will incite employees' perception of climate policies in negative light. Even considering existing jobs in renewable sources sector, the labor force is the least flexible component in production as compared to capital or land. It requires time, costs, even relocation.

Public environmental concerns contribute to decarbonization. This is exercised by making impact on governments. Policy usually responds to these concerns in an effort to maintain public trust.

According to studies, higher feed-in tariffs and higher renewable energy quotas significantly increase the use of renewable sources, while fossil fuel subsidies tend to substantially reduce them. However, these factors apparently fail to have rigorous effect on emissions. This may be a symptom of "weak" climate policies or continued use of high-emission sources in the "non-green" sector of electricity.

In contrast, economic and political factors (jobs in the fossil fuel industry) substantially increase emissions in the electricity sector. Additionally, employment/labor considerations also significantly inhibit the implementation and use of renewable resources.

Targeting climate policies and exclusively emphasizing the need for renewable sources is not an inherently adequate measure in decarbonization context. Introduction of more stringent climate policies will not be positioned to foster expected decarbonization levels as long as non-climate policies continue to directly or indirectly promote the use of fossil fuels. Addressing issues beyond the scope of climate policies, e.g. undermining interest in the use of regular fossil fuels (by means of labor market reforms or identifying other sources of income) can accelerate decarbonization processes.

7.2 EUROPEAN STRATEGY FRAMEWORK

"Clean Planet for All"[4]. On November 28, 2018 the European Commission issued a report presenting its long-term strategic vision of a prosperous, contemporary, competitive and climate- neutral economy by 2050, which is known as the *Clean Planet for All*. The long-term strategy outlines how Europe is positioned to lead climate-neutral practices by investing in viable technology solutions, empowering people and coordinating actions in various directions, in particular, production policies, finances, research, at the same time upholding social equity in transitional process. The strategy envisages streamlined actions in the following seven strategic directions:

1) Maximize the benefits from **energy efficiency**, including zero-emission buildings;

[4] https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/2050-long-term-strategy

2) Maximize the deployment of **renewables** and the use of electricity to fully decarbonize Europe's energy supply;

3) Embrace clean, safe and connected **mobility**;

4) A competitive EU industry and the **circular economy** as a key enabler to reduce greenhouse gas emissions;

5) Develop an adequate **smart network infrastructure** and **inter-connections**;

6) Reap the full benefits of **bio-economy** and create essential **carbon** sinks;

7) Tackle remaining CO2 emissions with **carbon capture and storage**.

"Clean Energy for All Europeans" [5]. On its way to upholding commitments undertaken by the Paris Agreement for the transition to clean energy from fossil fuels and to reduce GHG emissions, the EU has fundamentally revised its energy policy framework, which was published as package, titled "Clean Energy for All Europeans". It consists of 8 legal acts which came into full force in mid-2019, whereas 1-2-year timeline was set for EU countries to bring their national laws in coherence with these directives. The changes embodied significant benefits for consumers, the environment, and the overall economy. The framework also will significantly contribute to fulfilment of objective set by long-term strategy for achieving carbon neutrality by 2050. Thus, the policy-making directions (including the relevant 8 directives) are:

Energy performance in buildings. In the EU, this sector accounts for 40% of energy consumption and 36% of CO_2 emissions. For comparison, in Armenia, as of 2016 the same indicators were 36% and 18%, respectively.

Renewable Energy. Claiming to be a leader in renewables, EU targets by 2030 to increase the share of renewable energy up to 32%.

Energy Efficiency. Prioritizing energy efficiency is a key issue reflected in the package, as energy saving is the most straightforward way to save consumer resources and reduce GHG emissions. EU target for 2030 is at least 32.5% improvement in energy efficiency.

Governance regulation: The package includes a rigorous management system set by Energy Union that requires member states to formulate their 10-year national energy and climate programs for 2021-2030.

Electricity Market Design. This measure aims to establish a contemporary context for the EU electricity market to foster its adaptation to new realities, ensure more flexible, more market-oriented and more favorable environment in terms of accommodating greater share of renewable sources.

In addition to legal acts, the Commission has also launched several non-legal initiatives aimed at ensuring smooth transition to clean energy.

European Green Deal. In pursuit of its ambitious goal to become the leading climate- neutral continent in the world by 2050, the European Commission released the European Green Deal on December 11, 2019. This is a new growth strategy which aims to set the EU economy on a sustainable track by transforming climate and environmental challenges into opportunities. The transition is designed in a way as to ensure adherence to principle of justice is and fully respect the inclusiveness principle, where interests of any stakeholder groups are taken into consideration. The European Green Deal sets a path for a transition that is just and socially fair. The strategy covers all sectors of the economy, particularly - energy, transport, agriculture, residential sector, industrial sector (copper, cement, telecommunications and information technologies, textiles, chemicals). Accordingly, the components of the European Green Deal are:

- ✓ Increasing the EU's climate ambition for 2030 and 2050
- ✓ Supplying clean, affordable and secure energy

[5] https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans

- ✓ Mobilizing industry for a clean and circular economy
- ✓ Building and renovating in an energy and resource efficient way
- ✓ Accelerating the shift to sustainable and smart mobility
- ✓ From 'Farm to Fork': designing a fair, healthy and environmentally-friendly food system "
- ✓ Preserving and restoring ecosystems and biodiversity
- ✓ A zero-pollution ambition for a toxic-free environment

At the same time, the strategic declarations in these areas are materialized through the relevant roadmap, which envisages the key actions and measures for developing and adopting appropriate strategies, action plans, research, legal regulation in each direction by 2020-2021 (primarily within 2020).

"20 results for 2020". Through the Declaration of the 5th Eastern Partnership Summit held in Brussels in November 2017, the 20 key results to be achieved by 2020 were set out, which are expected to have substantial benefits for the European Union and the six Eastern Partnership countries in terms of transparency and inclusion. The annex to the Declaration identifies the four priority areas where the Parties undertake to record tangible results in the daily lives of their citizens. Stronger cohesion in the fields of transport and energy, as well as environmental and climate change are envisaged under the declared 3rd priority - Stronger Cohesion. In particular, the abovementioned priority will include, amongst other things, increasing energy efficiency and renewable energy use, reducing GHG emissions.

Comprehensive and Enhanced Partnership Agreement between the European Union and Armenia. The European agenda for climate, and in its context – energy sector mitigation policies, as of its current contents, is included in the Armenian agenda by the **EU-Armenia Comprehensive and Enhanced Partnership Agreement**, which was signed on November 24, 2017. In the framework of the revised European Neighborhood Policy and the Eastern Partnership, the new agreement replaces the EU-Armenia Partnership and Cooperation Agreement ratified in 1999. Thus, Chapter 4 of the Agreement is related to climate-related activities, under which a number of measures will be promoted by means of cooperation, in particular, related to:

- climate change mitigation,
- climate change adaptation,
- market and non-market mechanisms to address climate change issues;
- exploring, developing, demonstrating, deploying, transmitting and disseminating new, safe, sustainable and tailor-made innovative low-carbon technologies;
- incorporating climate change considerations in general and sectoral policies, and
- Awareness raising, training and education.

At the same time, it is stipulated that the cooperation shall pursue such objectives as:

- ✓ Actions aimed at fulfilling the commitments under Paris Agreement,
- ✓ Capacity-building measures aimed at taking effective actions on climate change;
- ✓ Developing an overall climate-related strategy and action plan for long-term climate change mitigation and adaptation;
- ✓ Developing vulnerability and adaptation assessments;
- ✓ Elaborating low carbon development plan,
- ✓ Developing and implementing long-term climate change mitigation measures by addressing the issue of GHG emission quotas;

- ✓ Measures towards the sale of carbon emissions quotas;
- ✓ Measures to promote the technology transfer process;
- ✓ Activities aimed at incorporating climate change considerations in general and sectoral policies
- ✓ Measures related to ozone depleting substances and gases containing fluoride.

In the context of trade and investment contributing to sustainable development, it is stipulated that the Parties seek to support the elimination of barriers to trade and investment in such products and services, which are of crucial importance in terms of climate change mitigation and adaptation, in particular, sustainable renewable energy and energy efficient products and services, including:

(i) by adopting a policy that promotes the use of the best available technologies;

(ii) by encouraging standards that meet environmental and economic needs;

(iii) by minimizing technical barriers to trade.

The chapter on Energy Cooperation (Part 5, Chapter 2) focuses on cooperation in the **use of renewable energy sources, promotion of energy efficiency and energy saving**.

For the implementation of the Comprehensive and Enhanced Partnership Agreement between the Republic of Armenia and the European Union and the European Atomic Energy Community and their Member States, the Prime Minister of the Republic of Armenia approved the relevant roadmap by the Decree N 666-L of June 1, 2019, by which 250 actions are stipulated.

In particular, specifically in the context of cooperation in the field of energy, 42 measures are envisaged, **34 of which cover the field of energy saving and energy efficiency**, **as well as alternative energy**. Majority of these measures (27) are aimed at developing new technical regulations at the EAEU or national level, and 6 are related to amendments and enforcement of legal regulations on standardization and certification.

The Roadmap also envisages 12 measures within the framework of climate change actions. These measures are mainly related to mitigation policy.

8. MITIGATION POLICY FRAMEWORK IN ARMENIA'S ENERGY SECTOR DEVELOPMENT POLICY DOCUMENTS

The key document of Armenia's energy sector is the long-term development strategy. Its new, revised draft - "Strategic Development Program for the Armenian Energy Sector (up to 2040)" (Strategy) is currently underway, at the stage of discussion by the Government.

It is noteworthy that the Strategy should be developed based on fundamental principles embodied in the Government of Armenia program, which in particular stipulates a very clear agenda for energy sector. More specifically, as declared by the Government, the energy policy will be aimed at fostering energy independence and security of the country, facilitation of regional integration process, sustainable development of the energy sector based on comprehensive use of local primary (renewable) energy sources, further development of nuclear energy, diversification of energy supply and introduction of new and energy efficient technologies.

Government has planned initiatives and policy directions in the field include, in particular:

- ✓ The process of gradual liberalization of the electricity market;
- ✓ Development of legislative incentives for the implementation of contemporary high technologies, driving energy sector progress and elaboration of policies for the introduction of energy efficiency measures;
- ✓ Promoting the efficient use and development of renewable energy sources;
- ✓ Construction of solar power plants by 2022, whereby the share of these stations in the internal consumption structure to be expected to reach no less than 10%.

In general, the Government declares its intention to support further deployment of sustainable energy, in view of the requirement to introduce a

system of energy management which will contribute to enhancing capacities and increasing efficiency of energy consumption by public and private sector, developing private-public cooperation opportunities at community level, strengthening cooperation with international institutions in an effort to promote mechanisms for energy efficiency and renewable energy use, as well as forming the scope of energy efficiency and long-term targets for renewable energy.

Based on the program objectives formulated by the Government of the Republic of Armenia, the Draft Strategic Plan reflect the long-term (2040) vision of the energy sector by "clean and energy-saving sustainable development" objective. It is noteworthy that two of the 5 key development priorities are specifically targeted towards mitigation policy and one priority, in particular has a significant effect in terms of:

- **Maximized use of renewable energy potential**

  Maximized use of renewable energy potential, especially in view of the fact that it is part of a least cost electricity generation capacity development plan, is one of the key priorities for the development of the energy sector. The construction of solar power plants, which are the most economically feasible for Armenia's conditions, given the resources available and technology development trends worldwide, will take precedence over the other types, taking into consideration the constraints imposed by the system's reliability and security indicators.

- **Full utilization of energy saving potential**

  All sectors of the Armenian economy have ample potential for energy saving, including transport, production, multi-apartment buildings, the public sector, fuel and energy systems etc. The Government of the Republic of Armenia strives to consistently pursue the deployment of a new energy saving culture, and to that end, it aims to implement institutional reforms, promoting investment in energy saving and increasing accountability.

- **Gradual liberalization of the electricity market**

  The current model of the Armenian electricity market has been in effect since 2004 and is based on the "sole buyer (seller)" principle, according to which the holder of electricity distribution license is authorized to purchase electricity from the power stations and sell it to consumers. In several developed and developing countries, electricity markets are already liberalized. Armenia has also launched this process and is planning to make transition to a new liberalized market model in the coming years, which, although carrying some constraints for competition, yet will have a clear roadmap towards full liberalization, given the process of the EAEU common energy market formation and the EU Comprehensive and Enhanced Partnership Agreement.

The strategy stipulates that the operational life of the **nuclear power plant** will be prolonged to 2026 by implementing the relevant investment program. At the same time, it is envisaged that if as a result of relevant studies, the safe operation of the nuclear power plant would be justified beyond 2026 too, the government intends to prolong its operation until 2036. Leaving aside the geopolitical, financial, and security considerations of the issue, it is noteworthy that the Strategy emphasizes its climate impact, noting that **"... only with the existence of a nuclear power plant in the system it becomes possible to achieve the lowest possible greenhouse gas emission levels."** At the same time, the Strategy stipulates that after the end of the nuclear power plant's operating life (including its extensions), the option of building a lower capacity power block on the existing power plant platform is under consideration, which on one hand will definitely contribute to lessening Armenia's dependence on imported natural gas, while it may also presumably diminish the emissions reduction potential.

Findings of research covering OECD countries indicate that rising **fossil energy prices** contribute to decarbonization. In this context, the following observation envisaged by Strategy is remarkable: "As concerns possible changes in the price of

imported natural gas by 2040, should such increase materialize, the costs of the overall energy system can be brought down by maximizing the potential of solar and wind power plants."

The Strategy contains several statements from the perspective of maximizing approximation to European energy policy. In particular, it is envisaged that the liberalization of the electricity market will require the transition to a **new market model**, which will be implemented over the next few years, with long-term targeting to full market liberalization. The new market model will at this stage be based on modern electricity trading rules, operate through supply and demand balancing, and will define market participants' accountability mechanisms during trade. This first phase of reforms will be followed by the development of a new RA Law on Electra energy, which will take into account the requirements of the EU directives, thereby marking the launch of the second phase of reforms. During this phase of reforms, opportunities for a fully competitive market formation will be considered.

At the same time, in the context of the regional energy cooperation it is also stated that "Armenia, being a member of the EAEU, participates in the formation of the EAEU common energy market. At the same time, Armenia has concluded a Comprehensive and Enhanced Partnership Agreement with the European Union, which envisages the gradual introduction of European Union energy directives."

Moreover, with reference to the EU CEPA Roadmap, the Strategy stipulates that as a result of the approximation to EU directives and regulations, a new set of incentive tools will be introduced for the **use of renewable energy sources**, thereby attracting new players in the market. It is envisaged that **new standards of energy efficiency and energy saving will be set**, **including in energy labeling and eco-design**. These approximations are planned to be implemented within the upcoming ten-year period, thereby giving new impetus to the state policy carried out in the field of energy saving and energy efficiency (buildings and structures, energy consuming equipment and transportation means), which will significantly reduce internal energy consumption levels.

Another evidence of Strategy's orientation towards mitigation policy is a separate section dedicated to **energy saving**, which specifically highlights that the Government of the Republic of Armenia considers energy saving as a national priority in terms of energy security, economic competitiveness and reduction of negative impact on the environment. However, it should also be noted that the section mainly outlines the benefits of energy saving in general, and in terms of the policy to be implemented, it merely refers to the development of National Energy Efficiency and Renewable Energy Program of the Republic of Armenia for 2021-2030.

In the context of the management of state-owned companies, the Strategy sets out the goal of developing renewable and energy-saving production, whereby **maximum utilization of alternative energy sources (wind power plants, solar photovoltaic plants)** is envisaged with the introduction of a new management model.

Finally, in the event of implementation of the Strategy and ensuring appropriate investment flows, the document stipulates expectations by 2040, which, in particular, include:

- **Economically feasible and efficient use of renewable energy resources** in accordance with all environmental standards. Take efforts towards maximizing renewable energy share in the energy balance, with at least 10% to be attributed to solar energy.
- **Large-scale implementation of energy saving and energy efficiency measures**, introduction of energy saving and energy efficient technologies in the transition to a green and knowledge-based economy.
- **Liberalized electricity market** based on the best international models.
- **Development of nuclear energy for peaceful purposes**, in particular, the construction of new nuclear power block(s) in Armenia.

9. MITIGATION STRATEGIES IN AGRICULTURE

Agriculture is the second largest sector on the GHG inventory in terms of emissions. For comprehensive understanding and adequate response to climate change impacts on agriculture, it should be considered that there are two main areas of policy intervention. The first strategy is to reduce the magnitude and pace of climate change itself, by reducing GHG emissions, i.e. the anthropogenic causes of climate change. The second (complementary) option is to develop climate change adaptation capacities in order to reduce the impact and be able to fully benefit from emerging opportunities. Moreover, adaptation efforts may also include a possible response to the effects of climate change (potential market impact, shifts in comparative advantages, increased migration levels, etc.) elsewhere in the world, or of mitigation actions (increased biofuel production or changes in land use).

Numerous approaches can be applied to reduce GHG emissions related to agricultural and livestock products. There are many alternative intervention options for each source of emissions, and the efficiency of each is determined by the particular system of agriculture. Interventions aiming to mitigate severity of production emissions are generally in concordance with increased productivity and/or savings perspectives and are therefore in the best interests of agricultural businesses. Nevertheless, emission-boosting practices also carry environmental risks or entail social compromises. In other cases, while mitigation measures may not have direct impact on productivity, yet they may provide opportunities to address other issues, such as improved water quality through good management of manure stock.

In general, in terms of the supply in the field of agriculture, mitigation strategies can be outlines as follows:

- Sustainable intensification
- Improved nitrogen fertilizer management
- Reduction of emissions from enteric fermentation
- Sequestering carbon in agricultural systems
- Manure management
- Forest emission reductions and forest carbon sequestration

Sustainable intensification

It is well known that agricultural yields may be improved either through expanding production or through production intensification (intake). In terms of mitigation effectiveness, intensification is more preferred option. Thus, intensification diminishes the magnitude of agricultural emissions. Intensification implies "more output with less resources" leading to more efficient use of investment. Traditional intensification practices are usually based on changes or direct incremental investments such as improved species/breeds, agrochemicals, water, machinery. The expansion can cause significant increase in emissions, particularly as a result of the conversion of soil using large carbon reserves, especially in view of poor forest management. However, in some cases, expansion may be beneficial, for example, when the expansion is exercised by means of degraded lands use. On the other hand, intensification usually increases the emissions effect (lower emissions per unit of output). With good management practices, intensification may circumvent land conversion as larger agricultural production may be deployed on the given land area. In practice, intensification and expansion are applied as combination options. Applications of intensification are complex, and its drivers should be carefully evaluated to avoid possible disruption. Most efficient production methods may lead to reduced investment costs and higher rates of return, thereby encouraging the business to expand land use or production. This is known as the rebound effect of intensification. This level in its turn depends on a number of factors - elasticity of demand and price, availability of additional land, prices, etc.

Thus, the strategy of sustainable intensification is generally geared to meet the growing demand through acceptable agricultural productivity while maintaining social, environmental and behavioral sustainability standards.

CO - BENEFITS	TRADE - OFFS
Food safety Contributing to food availability, sustainability and improved nutrition.	**Long-term risks** Structural Vulnerability: Reliance on modern inputs (agrochemicals, fewer species, energy) accompanied by social (loss of habitats, diminished cultural and social values) and environmental (biodiversity, animal loss) compromises which threaten the sustainability of global agriculture.
Economic development New opportunities for economic development. In particular, intensification within inefficient systems can contribute to increased rates of return for businesses profitability and improved living conditions.	**Social and economic exclusion** Significant socio-economic and cultural implications, especially when the majority of the population depends on an extensive, inefficient agricultural system in the context of their employment, livelihoods, social security, cultural traditions.
Environmental quality Alleviating the pressure on land, forests and natural resources, the benefits of which may have larger than merely local significance.	**Environmental Degradation** Excessive use of technology solutions can have serious inadvertent effects on the environment (groundwater pollution due to abuse of fertilizers, adverse effects from manure accumulation, and antibiotic-induced adverse global effects on health).

Improved nitrogen fertilizer management

The basic approach to good management over the use of fertilizers is the adequate use of nitrogen by ensuring coherence between the nitrogen fertilizer supply and the crop's nitrogen demand. In this regard, the following are essential factors: 1) quantity (supply to the plant's absorption capacity), 2) timing (supply when the plant needs to be supplied), 3) type (required nutrition balance), 4) location (supply where the plant can uptake it undisrupted, such as injecting into the soil and closer to the root, rather than scattering). These practices, although not very costly, yet are knowledge-consuming and often resource-consuming, too. There are many technologies and tools that can ensure efficient use of nitrogen. In particular:

1. **Plant breeding and genetic modification** to increase nitrogen uptake by the plant to yield the same harvest with less fertilizer used.
2. **Better estimates and usage of organic fertilizer** to make the agricultural system less dependent on external instilments. At the same time, it is not desirable to underestimate the effect of nitrogen instilments.
3. **Intervention management decision support tools** (time, degree, type). These tools range from region-specific consulting to computerized models with, e.g. management through mobile devices.
4. **Regular soil testing** to develop a suitable nitrogen management plan. This process can be organized at the regional level, providing appropriate consultations are available.
5. **Technologically advanced fertilizers**. For example, these can be a slow-release fertilizer that regulates nutrient transfer by preventing duplication of uptake, as well as nitrification inhibitors, which slow down the degradation of nitrogenous fertilizer so that chemical elements remain active and accessible to the plant over a longer period. Newer-generation fertilizers are as a rule more expensive and are generally viewed as second-stage technology after initial considerations (time and degree) have already been put to use. In addition to the

misuse and fertilizer management challenges, synthetic fertilizers are also a major source of GHG emissions and air pollution, as their production consumes a considerable amount of energy as well as fossil fuels used as raw materials. Significant improvement can be achieved in production, by fostering efficient productivity. They are usually costly solutions; however, they can lead to increased productivity, which is in the best of interests for both producers and the government.

CO - BENEFITS	TRADE - OFFS
Cost efficiency Increasing fertilizer use along with production efficiency reduces capital costs	**Potentially less harvest yield** Businesses accept the informed risk of potentially less harvest yield due to reduced nutrition. This will happen when nutrition level is less than optimal.
Increase in yield Optimal use of fertilizer contributes to long-term yield on soil.	**Potential shortage of workforce and capacities** Changes in fertilizer management practices may require additional workforce and technical knowledge
Reduced pollution Increased nitrogen availability in the vegetation system reduces environmental leakage and contamination of surface and groundwaters. Moreover, less demand for synthetic fertilizer and improved fertilizer production leads to reduced air pollution.	**Special inputs** Often, identifying the right type of fertilizer can be a challenging task.
Improved health safety High quality of air and water as a result of fertilizer management and production safeguards, leads to improvement of health safety and reduced public health costs.	

Reduction of emissions from enteric fermentations

Intestinal fermentation is part of the digestive process in herbivorous animals. Their four-chamber stomach with complex microbial environment allows them to digest complex carbohydrates, resulting in production of methane as an auxiliary product. In 2016, methane emissions from intestinal fermentation of agricultural animals accounted for 53.1% of total emissions attributable to “Agriculture” sub-sector. At the same time, the major part, 90%, of methane emissions from the intestinal fermentation of agricultural animals is attributed to large cattle.

There are three ways to reduce intestinal fermentation.

1. **Improving feeding practices**. Feed processing and supplementation of dietary structure by grain concentrates are effective ways to improve digestion and rapid growth of livestock. These are the most popular methods of intervention because they are typically low tech, low cost, low risk and at the same time ensure productivity growth.
2. **Supplements and additives**. These interventions may contribute to reducing methane production by altering the microbiological environment in the stomach. This option is particularly characteristic for highly efficient systems where the animal relocations are restricted at least at a certain phase, as the basic diets in this system are already optimized and it can be challenging to supply supplements in pastures. This

intervention carries some potential but still requires further research and/or it may not prove to be cost effective.

3. **Herd management and breeding**. Optimizing the health and reproductive capacity of the herds can reduce the number of livestock required for production in herds. Interventions can be manifested through the prevention of major diseases, effective maintenance of barns and supply of high-quality breeds. After all, the optimal method of reducing intestinal fermentation emissions is to reduce grazing populations. When livestock are kept for non-rearing purposes or for purposes other than meat production, their life expectancy is significantly prolonged. When the livestock is kept long enough to reach the slaughter weight, the per-unit emission attributable to that animal increases, furthermore, the entire flock is forced to maintain full volume of output. Feeding and herd management practices target a lower level of livestock required to ensure a given level of production. Since this intervention option is in line with the objective of increased productivity, for many livestock populations the reduction of intestinal emissions contains significant potential for cost-effective mitigation in agriculture.

CO - BENEFITS	TRADE - OFFS
Productivity and profitability Improved efficiency contributes to productivity growth and open opportunities for smallholder farms.	**Mirror effect** Improvements are likely lead to a mirror effect, resulting in reduced production costs and high profitability which in its turn leads to production expansion, often accompanied by various negative side effects, such as deforestation.
Health and reproduction Nutrition targeting Improves livestock health and reproduction, and hence improves overall livestock production and livelihood.	**GHG emissions** Some practices, such as pasture fertilization, may become the source of additional GHG emissions or other environmental impacts, such as competition with other forms of biomass utilization.
Food safety and quality Increased efficiency contributes to meeting growing demand, especially for smallholder livestock farms.	
Other environmental benefits High level of productivity can have a positive environmental impact, such as less land degradation, less pressure on forests and other resources.	

Sequestering carbon in agricultural systems

Soil absorbs huge amounts of carbon. A number of soil and crop management practices exist which can increase organic carbon content in agricultural soils. Agricultural carbon stocks can also be formed by ground biomass. This method comprises three main directions:

1. **Carbon management in plant systems.** There are two ways of expanding carbon reserves in arable lands: 1) protect the resources available in the system by reducing erosion and slowing down decomposition of organic matter; 2) increase the amount of carbon in the system. The preliminary method for the first approach is to reduce the frequency of plowing the land. Another option is to introduce erosion control practices, such as

stratification, outlining, vegetation. The most common approach under the second option is to leave plant residues on the soil surface. Alternative options include ensuring availability of perennial plants, the use of biochar, or the use of fertilizers.

2. **Agroforestry**. This is an intensive land management system that combines terrestrial biomass with plants and livestock breeding (tree planting in pastures, forestry).
3. **Improvement of carbon storage in pastures**. Carbon storage in pastures can be protected and expanded through various measures that also promote pasture productivity (timing, rotation, grass cover types, use of biochar, fertilizers, and irrigation).

CO - BENEFITS	TRADE - OFFS
Food safety Improvement of soil organic matter contributes to higher soil productivity, reduces erosion, enables moisture retention and crop growth	**An alternative to using biomass** Biomass sources often have alternative uses: fuel for households, forage
Climate Resilience Better organic structure of soil contributes to higher resilience of agricultural lands to climate change. In particular, soil's high moisture retention feature helps to sustain soil resilience in dry conditions.	**Movement / Replacement** Processes (such as the expanded use of perennial plants) can replace the primary plants, which may result in reduced crop yields and indirectly contribute to change in targeted land use.
	Uncertainties and MRV Challenges There are no cost-effective means of recording carbon stocks in the soil as well as their changes over time.
	Reversibility Even if carbon is absorbed, there is no guarantee it will be retained by soil over a long period.

Manure management

Cattle are the main source of emissions in livestock breeding, yet they have less share in the manure stock, as they spend most of their pastime in grazing. Major part of manure stock is attributed to mostly monogastric animals (animals with single-chambered stomach, e.g. pigs, chickens). Although manure may be an effective and nutritious source for plants and pastures, however, when livestock is highly industrialized and geographically concentrated, existing soils will not be sufficient to absorb the manure generated. As a result, they often trigger water and air pollution, as well as become a source of GHG emissions. Although the primary mitigation option for the accumulated manure is anaerobic digestion, which is highly technological and costly, there are other, less technology-consuming and less costly alternatives.

1. **More efficient use of manure as a source of energy and nutrition for crops**. With adequate planning, proper manure management can reduce the need for synthetic fertilizers, replace fossil fuel, become a profitable business, increase arable land and pasture yields. The most common mitigation practices for accumulated manure consist in the use of methane or anaerobic autoclaves, which convert manure into electricity or natural gas. These autoclaves, however, are quite expensive and as a rule, not profitable for businesses unless there are special incentives envisaged under current policy.

2. **Storage and handling practices**. Emissions from stored manure can be substantially reduced in a number of ways, including reduced shelf life, manure covering, straw removal, deployment of waste management systems, etc. Although these measures are low technology and low cost, yet they are often resource-consuming and time-consuming. Therefore, there is a need for additional incentives to help increase productivity.
3. **Dietary change.** Changes in livestock diets (balanced protein, tannin and other nutritional supplements) can affect the volume and composition of manure, thereby contributing to reduced level of emissions. These too may require special incentives as they are not within business interests in terms of economic profitability.
4. **Diversified farming system**. For medium-scale diversified agricultural farms that combine crop and livestock breeding, it may be more efficient to derive benefits from manure. With good management, use of manure will increase productivity and reduce demand for nitrogen fertilizers.

In many countries, improved manure management was achieved by means of adequate environmental regulations. However, since manure has potential to create surplus value (electricity, fuel, fertilizer) and moreover, it embodies environmental and health benefits, combined introduction of regulatory measures and economic incentives may provide the best result.

CO - BENEFITS	TRADE - OFFS
Less environmental degradation Improved manure management reduces surface and groundwater contamination as well as air pollution.	**Cost of interventions** Mitigation costs are not covered by the benefits of increased livestock production, as manure is the ancillary effect of livestock breeding. Consequently, there is a demand for markets of potential manure transformations (electricity, fuel, fertilizer).
Health Improvements Improved manure management reduces odor and decreases health risks associated with pathogen transmission.	**Workforce and technological requirements** Labor-intensiveness, current level of access to technology and technical knowledge hinder progress.
Power source Manure can become a source of bioenergy.	
Source of fertilizer An opportunity to replace synthetic fertilizers.	

Forest emission reductions and forest carbon sequestration

Agri-ecosystems, particularly forestry and the crops sub-sector, are considered the most vulnerable to climate change. Almost 90 percent of countries in the Southern-Eastern Europa and Central Asia region prioritize adaptation in the agriculture sectors, particularly around forestry. At the same time, 60 percent of countries prioritize mitigation options on forestland. As it has been mentioned above, in terms of mitigation effectiveness, intensification tends to be preferable to expansion. Expansion can cause substantial emissions from the conversion of land with high carbon stocks, especially in forested areas with weak governance. Relevant activities,

such as the restoration of degraded lands, afforestation and the reduction of emissions from deforestation should be included in any land use related mitigation strategy. Substantial emissions reductions are possible by reducing land use change driven by the conversion of forests to agricultural lands. These emissions reductions should be possible, in theory, through sustainable intensification of agricultural lands combined with strong forest conservation policies. Across mitigation and adaptation options, afforestation/ reforestation is the most prevalent, as increases in above and below ground biomass can sequester carbon from the atmosphere on one hand and prevent erosion and reduce floods on the other. With floods and landslides amongst the most reported climate-related hazards in all sub-regions, as well as pest and disease incidence in forests amongst observed and/or expected climate impacts, it is not a surprise that ecosystem management, conservation and restoration activities in forest and woodland ecosystems is the most prioritized adaptation measure outside of farming systems. Enhancing forest cover in combination with sustainable forest management can address the GHG hotspots, climate-related vulnerabilities and policy gaps, including forest degradation, forest biomass burning, vulnerable forest ecosystems and pest and disease incidence in forest ecosystems.

As it was noted, mitigation strategies aimed at reducing emissions from agriculture have been considered from the supply perspective. However, demand-driven strategies evidently carry significant potential. Demand-oriented approaches have become increasingly popular globally, which is also gradually reflected in Armenian realities. Obvious conclusion called for is that one strategy in isolation cannot address the entire potential of mitigation in the field of agriculture. GHG emission reductions (supply) and consumption behavior shifts (demand) are the key pillars of the strategy. Naturally, there are also many cross-intersecting policies that foster new approaches and innovations.

10. ADDRESSING MITIGATION IN ARMENIAN AGRICULTURAL DEVELOPMENT DOCUMENTS FROM STRATEGIC AND PROGRAMMATIC PERSPECTIVE

Mitigation strategies are addressed to the extent that they concur with issues of increased effectiveness.

In the “Strategy directions for economic development of the Republic of Armenia Agriculture Sector for 2020 -2030” (Strategy) and in the “Livestock farming development program of the Republic of Armenia for 2019-2024” (Program) mitigation goals aimed at GHG reduction are not explicitly stated as such. Where specific emphasis and focus has been made in the context of climate change, they relate to policies for increasing resilience or adaptation policies in the sector or sub-sector. Existing concurrences with mitigation strategies are a consequence of addressing the goals of increasing efficiency, which although adds value, yet does not constitute adequate targeting in terms of emission reduction policy.

Thus, the **ten-year vision** of the Strategy directly stipulates adaptation to climate change and, at the same time, as a result of sectoral developments, it expects to have "... a happy and prosperous rural population living in harmony with environment..." which may presumably be achieved given the low-emission development prospects. In the context of the program, the objective is set differently. The formulated purpose of the program is to provide affordable conditions to livestock farmers in the RA, in particular by supply of breeding cattle at partially subsidized interest rates, which will motivate the farmers to replace cattle of unknown ancestry, or low-reproductive, low-yielding animals in herds by pedigree cattle with economically valuable features, develop the breeding, improving the local animal yields through interbreeding practices, to increase milk and meat production, reduce cost of milk and meat production, and eventually making it more competitive against imported similar products.

From the supply perspective, the *objective* of the Program directly correlates with the potential option of reducing emissions from intestinal fermentation, namely - improved herd management.

As noted above, this is definitely the case when emission reduction practices are in line with the goal of increasing efficiency, and thus beneficial to all parties. However, it should be borne in mind that the consideration pertains to emission reductions per unit, whereas the Program estimates gross product output from livestock breeding to be highly inadequate and targets to achieve a substantial increase in livestock headcount. In addition, as stated in the Program, during the period 2013-2018 a total of 2,195 heads of pedigree cattle was imported into the country, which constitutes around 49% of the total cattle headcount imported into the country during the same period. The maximum number of cattle imported in the country in the given time period is attributed to the year 2013 (705 heads) and the lowest number is recorded in 2014 (65 heads). The program targets for the period 2019-2024 to have imported 9960 heads of cattle. In other words, on the one hand, increase of livestock headcount is envisaged, on the other hand, gradual intensification of livestock breeding sector is expected. **This means that while the number of emissions may decrease on per unit count, it will still record increase in total count, quantitative assessment of which will require additional analysis.**

***Strategic principles, priorities, and program challenges* very incompletely and indirectly address mitigation components.**

The core principles on which the Strategy is based, have certain potential in terms of the policy instruments stipulated in concordance with GFG emissions reduction practices. In particular, the 1st Principle (Aggregation) which refers to supporting the consolidation of smallholder farms and fragmented value chains through the reduction of non- cultivated land and improvement of farming practices. The 2nd Principle (Commercialization) emphasizes the development of intensive gardening. The 6th Principle (Climate Change Adaptation, Resilience and Environmental Sustainability) has specific address, with directly emphasizing the formulation of "... functions related to sustainable use of mitigation resources ...". However, the interpretation of this principle also has an underlying context relevant for adaptation: awareness-raising, monitoring, application of "smart" farming practices, circulation of species with varied maturity and drought-tolerant species, as well as introduction of best practices in water and land management. There are also indirect interrelations stipulated in terms of the priorities declared by the Strategy, which contain elements of mitigation, in particular **encouraging intensification, capacity building and diversification of activities**. Among the identified challenges, a specific focus is made to the qualitative features of the land. In particular, it is stated that after privatization, the land was mainly cultivated without adherence to agrochemical rules, with predominantly prevailing unilateral fertilization and absence of scientifically-supported crop cultivation practices, which resulted in deterioration of soil quality and fertility, crop yields, and crop resilience, as well as yield quality. The program already stipulates that "the majority of livestock in the herd is of low breeding value", whereby the difficulties associated with breeding and rearing herds of high-yield pedigree cattle are characterized as mainly due to the "high cost of livestock, inadequate level of assets owned by livestock breeding farmers, high interest rates on loans, lack of animal insurance and animal collateral mechanisms, sharp fluctuations in livestock production and feed prices".

However, in order to fully disclose the potential for emission reductions in the sectoral policy documents in question, we need to take into consideration the set of measures to address the objectives specified under the set priorities. Thus, it can be assumed that some measures envisaged under the identified seven priorities and policy areas have some degree of overlap with mitigation strategies and mechanisms in the agricultural sector. In particular, the following may be distinguished as such:

- Under the **land reform** a targeted policy is envisaged to address the issue of deserted land. Given that degraded soils will also be included in the scope of deserted soils, the policy may contribute to the reduction of emissions (see *Sustainable Intensification*).
- The policy of **improving the quality of seeds and seedlings, promoting modern livestock breeding** is coherent with the concept of intensification, herd management and breeding practices (*see Sustainable Intensification, Reduction of emissions from intestinal fermentation*).
- Addressing **the sustainable development of organic farming** implies the design and improvement of infrastructures that are particularly in demand in term of effective implementation of "Nitrogen Fertilizer Management" and "Intestinal Fermentation Reduction" strategies.
- Targeting **human and institutional capacity building in the agricultural sector**, which implies providing agricultural advice, including in relation to innovations and up-to-date technologies, can help to record developments across *all five mitigation strategies.*
- **In the framework of support for sustainable development of rural communities,** it is planned to develop voluntary programs to promote good agricultural practices among agricultural producers and consultants. The latter will be related to soil erosion, soil organic matter, soil structure, minimum level of protection. In this context, it is possible to anticipate realization of some potential for emission reduction through the *"Improvement of Nitrogen Fertilizer Management"* and *"Carbon Capture in Agricultural Systems"* mitigation strategies.
- Under the priority formulated as **promoting digital agriculture and technological innovation,** several issues are emphasized, in particular: "majority of agricultural innovations are not digital in nature, e.g. different types of biotechnology (e.g. improved species), chemicals (e.g. new pesticides/herbicides), energy (e.g., autonomous solar grid systems), meteorology (e.g., building material used for greenhouse construction), crop protection (e.g. anti-hail grids) and innovations in the field of land cultivation (for example, landless, no-till and vertical cultivation systems). " The solutions envisaged in these areas may contribute to the implementation of *"Sustainable Intensification", "Improvement of Nitrogen Fertilizer Management"* and *"Carbon Capture in Agricultural Systems"* practices.

GHG emission reductions practices in the context of priorities set out by the Strategy and underlying measures envisaged are expressed through highly incidental and indirect impact channels.

At the same time, the Government implements nine annual state assistance programs (including the Program), of which 3 can be singled out (4, 5, 7) in terms of emission reduction potential. The possible impact of other programs is circumstantial, and mainly conditioned by the ancillary effects of increased efficiency and infrastructure development.

1. **Agriculture loans interest rates subsidizing Program**: It is aimed at lending coverage for development programs implemented in the agri-food sector across all communities of Armenia.
2. **State assistance program on financial leasing of agricultural machinery in the Republic of Armenia,** within the framework of which the farmers have the opportunity to obtain new agricultural machinery and equipment under leasing terms.
3. **State assistance program on financial leasing of agri-food equipment in the Republic of Armenia**, within the framework of which individuals, private entrepreneurs and legal entities, including agro-economic cooperatives, operating in the agricultural farming sector, have the opportunity have the opportunity to obtain required machinery and equipment under leasing terms.
4. **State assistance program for the construction or reconstruction of small and medium-sized smart barns and their technological refurbishment**, which offers 2 options of unbounded box-supported livestock barns and their technological refurbishment: lightweight construction livestock barns and other types of livestock barns.
5. **2019-2024 cattle breeding program for the Republic of Armenia**. The program is aimed at creating affordable lending conditions to livestock farmers in the Republic of Armenia, in particular by providing partial subsidies for the interest on loans received with the purpose of buying pedigree cattle. Within the framework of the project, farmers have the opportunity to acquire pedigree cattle locally or import it.
6. **Program for subsidizing interest rates on loans for procurement (purchase) of agricultural raw materials.** Under program on subsidizing the loan interest, targeted loans are provided to fruit and vegetable, grape and milk producers for the purpose of launching procurement processes, including for making prepayments.
7. **State support program for the establishment of intensive fruit orchards and vineyards, developed in Armenia with the use of modern technologies.** A subsidized loan or partial reimbursement of expenses is anticipated.
8. **Subsidy program for interest payments on loans provided for the introduction of hail protection grids in the RA.** The project framework envisages subsidizing interest on targeted loans for the introduction of hail-protection grids in orchards and vineyards.
9. **Co-financing program for introduction of modern irrigation systems.** Is it envisaged to provide subsidized loans or reimburse costs incurred by beneficiaries for the introduction of modern irrigation systems in areas cultivated by agricultural crop types (with the exception of hothouses and greenhouses). At the discretion of the beneficiary, drip or rain systems (waylaying pipe, head unit and distribution network) can be installed either by using contractor resources or by the beneficiaries on their own resources.

IV. OPPORTUNITIES FOR LEDS TARGETING IN SECTOR STRATEGIES

11. CONSIDERATIONS FOR INTEGRATING LOW-EMISSIONS DEVELOPMENT STRATEGY INTO ENERGY SECTOR POLICY

In this section, based on the European Energy Strategic Framework and stipulated policy mechanism, as well as considering the impact assessments of decarbonization methods in terms of above-mentioned OECD countries, we will make an attempt to identify to the extent possible, the gaps in Armenia's energy sector strategy documents from the point of view of approximation to European clean energy practices, and to identify policy mechanisms from the point of view of establishing a model that is approximated to the maximum possible extent to the European framework.

Essentially, the Comprehensive and Enhanced Partnership Agreement between the EU and the European Atomic Energy Community and their Member States, as well as the roadmap adopted for its implementation, constitute the mechanism through which the European Clean Energy Agenda is incorporated into an Armenian agenda. Accordingly, the following is a comparative table of policy priorities and tools in the light of European framework, the aforementioned agreement and the strategic approaches adopted by the Government of the Republic of Armenia.

As stipulated in Article 42 of the Agreement: "… Cooperation shall aim at regulatory approximation in the areas of the energy sector areas referred to hereinafter, taking into account the need to ensure access to secure, environmentally friendly and affordable energy." This means that Armenia is committed to ensure approximation of regulations in the energy sector to the EU framework, irrespective of the fact that the European climate and energy policy framework refers directly to the EU Member States, while Armenia is not a member of the EU Energy Union.

The Strategy stipulates that it will serve as the basis for the elaboration of a National Energy Sector Program-Timeline, which will set out specific target indicators and action plans to ensure implementation of the Strategy by 2040. The National Energy Sector Program-Timeline will be approved by the end of 2020. On the other hand, Paragraph 118.2 of the Government of the Republic of Armenia 2019-2023 Action Plan provides that by the 2nd half of 2021, the 10-year new Armenian Power System Perspective Development Plan of the (PSPDP) will be presented, and Paragraph 125 envisages presentation of National Energy Efficiency and Renewable Energy Program of the Republic of Armenia for 2021-2030 (NEEREP). This way of structuring strategic planning may to some extent jeopardize the system of strategic targeting and subordination of priorities. There may be a situation whereby all directions are rendered equal importance, yet, due to limited nature of allocated resources, the government will be positioned to choose the top priority among equals. Consequently, we may come across a situation where tactical decisions are not based on strategic decisions, resources are routed to channels, which are proven to be effective, and consequently the implementation of the strategy may not deliver the expected results. Naturally, the described strategic planning practice is not exclusively relevant for the energy sector, and it is likely that energy sector may eventually be positioned on a more favorable standing as compared to other sectors. However, it is appropriate to emphasize the issue in the context of this paper, as it becomes challenging to identify the policy mechanisms and/or to assess the gaps against the benchmarks selected. This is conditioned not only by the inadequate subordination within the strategic document, but also by the culture of formulating the actual wording of those documents. Furthermore, this issue will regularly emerge in the context of further discussion of specific areas.

The position and mission of the strategy in the system of sector-level strategic documents is unclear, given the uncertainty in terms of subordination of priorities, the overly descriptive nature of the provisions, and the insufficient disclosure of policy instruments and mechanisms.

Table 5. EU/RA comparative snapshot of clean energy policies

European strategic framework	EU-RA CEPA commitments / *roadmap*	RA energy sector policy
ENERGY PERFORMANCE OF BUILDINGS - **National roadmap on buildings' decarbonization** - **Smarter buildings (automated efficiency and monitoring systems)** - **Measure a building's capacity to use new technologies and electronic systems to adapt to the needs** - **E-mobility in buildings (e.g e-charging points)** - **Support and investment towards renovation of buildings** - **Combating energy poverty and reduction of electricity fees by means of renovation and improvement of performance in old buildings**	○ *Paragraph 58 states that the Law of the Republic of Armenia "On Energy Conservation and Renewable Energy" includes the requirement; "Technical Regulation on energy conservation and energy efficiency in the new residential building under construction, as well as in facilities constructed (reconstructed, renovated) at the expense of state funds" was adopted by the Government of the Republic of Armenia Decree N 426-N dated April 12, 2018.* ○ *Paragraphs 59 and 60 state that by Decree N 426-N dated April 12, 2018 the Government of the Republic of Armenia instructed the Ministry of Economic Development and Investments of the Republic of Armenia and the Urban Development Committee of the Republic of Armenia to develop and implement within twelve-month period normative technical documents, standards and template of compliance certificates to ensure energy efficiency of buildings (Energy Efficiency Certificate) and assessment of their performance indicators, together with the instructions for filling out the form.*	**HEATING SUPPLY OF BUILDINGS** - The government plans to gradually expand the implementation of such programs, encouraging that each building is equipped with its own heating and hot water production system, based on renewable energy resources. - In terms of heating supply and hot water production, solar water heaters and other individual systems using renewable energy sources for the production of energy for own needs may be a viable alternative to individual heating boilers. **ENERGY CONSERVATION IN BUILDINGS** - Consumption of energy for heating residential and public buildings can be reduced by at least 40% by means of efficient thermal insulation.
RENEWABLE ENERGY (target 2030 – RE portion - 32%) - **provides long-term certainty for investors and speeds up procedures to receive permits for projects** - **puts the consumer at the centre of the energy transition with a clear right to produce own renewable energy** - **increases competition and market integration of renewable electricity** - **accelerates the uptake of renewables in the heating/cooling and transport sectors** - **strengthens the sustainability of bio-energy and promotes innovative technologies**	- Promoting the use of renewable energy sources - Elimination of barriers to trade and investment in renewable energy products and services (technology transfer, development of standards, removal of technical barriers to trade) ○ *New legislative and sub-legislative regulations to promote the use of environmentally friendly and energy efficient motor transport*	**Renewable energy potential unleashed to its maximum capacity, as one of the key strategic priorities** - Development of a legislative framework for the provision of access to virtual power grids, which should allow remote interconnection of small-scale producers, including consumers, who have installed solar and wind power generating plants to meet their own needs, to sell electricity in the wholesale market, on equal footing with system- level grids. - Ensure the increase of the renewable energy share in the energy balance to maximum possible extent, whereby at least 10% should be contributed to solar energy - Each building should be equipped with its own heating and hot water production system based on renewable energy resources

		- Gradual penetration of electric cars can be encouraged, in particular, with exclusive use of solar and wind power - New incentive tools will be introduced for the use of renewable energy sources, because of which new players will enter the market.
ENERGY EFFICIENCY (Target by 2030 - 32.5%) - **reduced energy consumption for households and businesses – thereby lowering energy bills** - **lower consumption, making Europe less reliant on energy imports** - **incentives for producers/manufacturers to use new technologies and innovate** - **more investment, for example in the building sector, thereby creating jobs** - **clearer information in household bills**	- Promoting energy efficiency and energy conservation - Elimination of barriers to trade and investment in energy-efficient products and services (technology transfer, development of standards, removal of technical barriers to trade) o *Amendments to a set of legal acts aimed at encouraging energy conservation projects, including the construction of combined-cycle power plants and thermal power plants,* o *Paragraphs 62-68: approximation is achieved by means of the adoption of the draft EEU Technical Regulation "On Energy Efficiency Requirements for Energy Consumption Equipment". EAEU TR Project passed the EAEC collegial approval phase by Order N 118 dated 17.07.2018.* o *Paragraphs 69-88; Development of new technical regulations at EAEU or national level.*	**Realization of renewable energy potential to its maximum capacity, as one of the key strategic priorities** - Forming a new EE culture by implementing institutional changes, stimulating investment in the EC and increasing accountability - Large-scale implementation of EE and EC measures - Introduction of EC and EE technologies in the transition to a green and knowledge-based economy - The EC as a means to enhanced energy security of the country, achieving higher level of economic competitiveness and reduction of negative impact on the environment. - Promote energy conservation in all sectors of the economy. - TIMES Armenia platform allows for the least cost optimization to select the most efficient model for use of resources and technology implementation - New EE and EC standards will be established, including in energy labeling and eco-labeling. EU approximations envisaged to be implemented in the next 10 years, giving new impetus to the state policy in EE and EC sectors (buildings and structures, energy-consuming equipment and transport facilities) that will significantly reduce the levels of internal energy consumption.
GOVERNANCE (National 10-Year Energy and Climate Plans) - **cover all dimensions of the energy union, including energy security, the internal market, inter-connections, and research, innovation and competitiveness** - **ensure a transparent and coordinated planning, reporting and monitoring process, and promote**	- Energy strategies and policies, including those aimed to promoting energy security and diversity of energy suppliers and energy production - Enhanced energy security, including by promoting the diversification of energy sources and their transmission routes - Development of competitive energy markets - Promotion of regional cooperation around integration of energy and regional markets - Pricing policies, transit and transmission, in particular, a comprehensive cost-based energy transfer system and, where	- Development of a National Energy Efficiency and Renewable Energy Program of the Republic of Armenia for 2021-2030, which should be driven by considerations related to economic and energy security, enhanced level of energy system reliability, strengthening economic and energy independence, establishment of new industries and setup of services that promote energy efficiency and development of renewable energy, as well as reduction of the homogeneous impact on the environment and human health

closer cooperation between EU countries in these areas - **offer more clarity and predictability to unlock clean energy investments across the EU** - **ensure consistent reporting**	necessary, further adjustments to the availability of hydrocarbon reserves, as deemed appropriate. - Scientific and technical cooperation, including the exchange of information in the areas of technologies development and improvement in energy production, transmission, supply and end-use, with particular focus on energy efficient and environmentally friendly technologies o *Amendments to a number of legal acts aimed at creating a competitive market in the RA energy sector, encouraging competition, ensuring non-discriminatory market entry opportunities, segregation of system operators, strengthening the independent role of the regulator, and further elaboration of regulatory tools in line with the development of the competitive market.*	- Elaboration of a new prospective development plan for the Armenian power system to identify power system development measures for a 10-year period (planned for 2nd half of 2021) - Regional and EU cooperation
REGULATION OF POWER MARKET (more flexible, more market-oriented, more favorable for inclusion of larger share of renewable resources) - **Providing the Consumers with debriefs containing key contractual terms and conditions** - **Suppliers' connection to the grid within 24 hours (2026)** - **Providing the consumer free of charge with at least one instrument for choice of alternative energy** - **Obtain more specific and comprehensive information on electricity bills** - **More distinct identification of vulnerable and poor consumers in the energy consumption context, increased targeting of support** - **Active involvement of consumers (individually or in combination) in all market areas: production, consumption, sales, storage, etc.** - **Option to use smart meters and dynamic pricing contracts**	- Promoting regulatory principles reflecting key principles of energy market regulation as well as non-discriminatory access to energy networks and infrastructures with competitive, transparent and cost-effective tariffs and regulatory controls, and adequate and independent control mechanisms	- Free power market using the best international models - Expanding the existing mechanisms for reciprocal flows of autonomous energy producers, enabling them to establish virtual groups, involve residents and organizations, generate and consume electricity at different enrollment units within power system, etc. - fully digitalized control of processes in the energy sector, both in terms of production and consumption, through the application of smart consumption systems concept - Introduction of international environmental standards, automated management information system (MIS) and international management system based on ISO standards - All consumers to be connected to an automated power accounting system that will allow them to read commercial metering data remotely, making this data available in real time to both consumers and new entrants in retail power supply market, as well as for the market operator, creating a favorable environment for the liberalization of the retail market along with the digitalization process.

In Table 5. is the comparative analysis of the Strategy's directions versus the individual components of the European Energy Strategic Framework.

ENERGY PERFORMANCE OF BUILDINGS. The Strategy in this area addresses the issues of heat supply in buildings as well as thermal insulation of buildings in the energy savings context. The transition from the individual heat supply model to the building-wide heat supply approach is overall positive as a concept, however the document does not demonstrate sufficient level of determination, either in terms of coming up with a comprehensive policy package, or specific targeting of emissions reductions. The latter, perhaps, calls for the need to establish a more thorough research base than mere observation of the fact that combined heating option is preferred over the individual option. Furthermore, the combined option should not be limited to one single building unit. Scenarios can be diverse (single building, building complexes, blocks, etc.), which can be identified only by applying appropriate models. Different policy tools would then be identified based on possible scenarios. Whereas, the Strategy emphasizes the possibility of resolving the problem within the framework of a single lending program (the Energy Efficient Lending Program implemented in the non-gasified communities of Armenia with the participation of the Renewable Energy and Energy Efficiency Fund). Presumably, in view of the variety of options to solving the issue, the European framework provides a separate roadmap for decarbonizing buildings. As concerns the reduction of energy consumption in buildings by 40% by thermal insulation, this section (Energy Efficiency) does not provide policy tools or mechanisms other than descriptively highlighting the general benefits of energy efficiency. The NEEREP to be elaborated is specifically underlined, which implies that the national program should formulate a comprehensive policy package in this direction, including smart building concept, technology absorption capacity assessment, energy poverty alleviation areas. It should also be noted that these issues cannot be expected to be fully resolved solely in the energy policy domain: systematic, sustainable and long-term solutions could be achieved by implementing fundamental reforms in the multi-apartment building management.

From the point of view of improving the energy performance of buildings, the approaches set out in the Strategy fail to reflect adequate level of determination in terms of establishing long-term solutions and formulating a comprehensive policy package. Specifically, policy gaps in the concept of smart buildings, building decarbonization, technological absorption capacity enhancement, energy poverty alleviation should be eliminated both by means of the National Energy Efficiency and Renewable Energy Program, as well as by initiating reforms in the area of building management.

RENEWABLE ENERGY. The strategy defines the most efficient use of renewable energy as one of the key strategic priorities. Moreover, the construction of solar plants is prioritized over other types, considering it the most economically beneficial for Armenia. At the same time, the prospect of solar energy's long-term development is largely driven by the existence of storage plants whose cost (as presented in the Strategy) is not economically viable at present. This is a targeted policy approach, especially when the commitment of the state is also stipulated, by envisaging US $ 600-700 million investment in public-private partnerships to address the issue. Another policy mechanism consists in the approach that under the more ambitious targeting scenario, the government proclaims that public-private co-operation contracts will be concluded exclusively through attracting investors by the competitive bidding process, and only when their entry into the electricity market is impossible without additional guarantees from the Armenian government. In general, these approaches correlate with the instruments envisaged by European Strategic Framework for Renewable Energy. However, it should be emphasized that the Strategy does not address goals for ensuring long-term credibility for investors and accelerated process of issuing permits. Whereas these, in particular, are the key challenges on the way to the elimination of barriers to trade and investment in renewable energy products and

services (technology shifts, standards development, technical barriers to trade), addressed by the Roadmap for the Implementation of the RA – EU CEPA.

The strategy on renewable energy generally covers the European agenda, except for the need to provide investors more credibility, as well as more viable and attractive conditions. In this sense, there is a need to improve the regulatory framework, especially in terms of facilitating administrative procedures for market entry and eliminating technical barriers to trade.

ENERGY EFFICIENCY. This agenda includes an energy saving component, which is another priority set by the Strategy. The document states that there is a great potential for expanding energy efficiency in all sectors of the Armenian economy and emphasizes the need for cultural change and institutional reform to be able to fully unleash its potential. At the same time, the intention is declared to implement large-scale energy saving measures, as well as the importance of energy security, economic efficiency and environmental protection are highlighted in this context. However, it should be noted that a rather limited package is provided in terms of policy instruments. The primary emphasis is made on approximation to European standards, including in terms of energy labeling and eco-labeling. Without prejudice to the role of the introduction of new standards, other components of the European Energy Efficiency Agenda should not be ignored either, which, unlike "coercive" instruments (if we qualify the introduction of standards as such), are predominantly incentives and motivating mechanisms, and hence - more sustainable and efficient. They pertain to encouraging producers to apply new technologies, attracting more investment for buildings, and providing clear information on household payments. There is an explicit need to complement the policy mechanisms in these areas, which should be one of the key goals of the National Energy Efficiency and Renewable Energy Program. At the same time, the Strategy fails to set a quantitative target or outcome that would express the country's ambition in terms of increasing energy efficiency.

In terms of energy efficiency, the Strategy contains rather declarative provisions or more specifically targets the energy saving component. In terms of policy instruments, the main focus is on the introduction of pragmatic standards, while the European framework, in addition to "coercion" instruments, also includes incentives such as encouraging producers to apply new technologies and attract investment for buildings.

MANAGEMENT: In this area, the European policy package is expressed through integrated national 10-year energy and climate plans, which should be harmonized with the objectives and targets of the Energy Union. In practice, Armenia addresses the Energy Union pillars in the Strategy, in the new National Energy Efficiency and Renewable Energy Program for 2021-2030, Armenia's electricity system prospective development plan, as well as through regional (including with the EU) cooperation. The fundamental concern here perhaps relates to ability to adequately develop and implement these documents, which are designed to contribute to the achievement of goals related to economic and energy security, enhanced level of reliability in the energy system, strengthening of economic and energy independence, creation of new production types and provision of services aiming to promote development of energy saving and renewable energy, as well as mitigation of anthropogenic impact on the environment, human health.

The planned strategic documents in fact address the European agenda on management. It is necessary to ensure their proper development and effective implementation while respecting the principle of integration with climate policies.

ELECTRICITY MARKET REGULATION: The strategy addresses the substantive reforms in the electricity market regulation and its subsequent phases, essentially addressing the commitment stipulated by EU-CEPA Roadmap implementation, i.e. to cooperate with the EU on regulation aspects reflecting key principles on energy market regulation, as well as to ensure promotion of non-discriminatory access to energy networks and infrastructures by means of competitive,

transparent and cost-effective tariffs , as well as adequate and independent oversight. In order to ensure sustainable. The strategy emphasizes the need to adopt best international models of the electricity market, the introduction of digital management practices, the implementation of international environmental and management standards, the liberalization of the market and ensuring full access to information for consumers.

Regarding the electricity market regulation, the Strategy provides a comprehensive scope of reforms, covering the phase already launched as well as the subsequent phases along with their objectives.

12. CONSIDERATIONS FOR INTEGRATING LOW-EMISSION DEVELOPMENT STRATEGIES INTO AGRICULTURAL POLICY

The relevant section of this analysis set out possible mitigation strategies in the agricultural sector from the perspective of the supply. Simultaneously, "Strategy directions for economic development of the Republic of Armenia Agriculture Sector for 2020-2030" and the "Livestock farming development program of the Republic of Armenia for 2019-2024" were included in the scope of analysis in terms of their addressing mitigation targets for GHG emissions reduction. The results of analysis were subsequently considered from comparative standpoint. Based on these studies, a comparative outlook will be presented in this section aiming to highlight the key conclusions from the point of view of low emissions development.

Thus, the first column of Table 2 presents the mitigation practices. The next column sets out the appropriate priority in the Strategy (and the measures to be taken under the priority), which can be inherently considered in the context of this mitigation practice, irrespective of whether the Strategy provides direct emphasis to this aspect. The last column lists the state assistance program(s) that have some potential in terms of the given mitigating practices, and in this case, too, regardless of whether they contain direct addressing.

It is obvious at first glance, that the effectiveness of the integration of mitigation strategies into the agricultural sector development agendas almost in all cases is invariably conditioned by the efficiency of human and institutional capacity building in the agricultural sector, as well as by the effective promotion of digital agriculture and technological innovation. And this is not incidental, as the sector development prospects are largely dependent on the fundamental implementation of knowledge-based economics.

Table 6. Addressing Mitigation Strategies in Program Documents

MITIGATION PRACTICES	STRATEGIC PRIORITY	STATE SUPPORT PROGRAMME P1 - P9
SUSTAINABLE INTENSIFICATION **IMPROVED** - **SPECIES** - **BREEDS** - **AGROCHEMICALS** - **WATER** - **MECHANIZATION**	✓ **Land reform** (targeted policy related to the issue of abandoned land, includes also degraded land) ✓ **Improving the quality of seeds and seedlings, promoting use of modern practices for animal breeding** (intensification, herd management and breeding) ✓ **Development of human and institutional capacities in the field of agriculture** ✓ **Promoting digital agriculture and technological innovation** (digital innovations, such as improved varieties, new pesticides / herbicides, solar autonomous grid systems, greenhouse construction materials, anti-hail grids, soilless, no-till and vertical cultivation systems	**P1** **P2** **P3** **P6** **P7** **P8** **P9**
IMPROVED NITROGEN FERTILIZER MANAGEMENT **PLANT BREEDING AND GENETIC MODIFICATION,** **BETTER ESTIMATES AND USAGE OF ORGANIC FERTILIZER,** **INTERVENTION DECISION SUPPORT TOOLS,** **REGULAR SOIL TESTING,** **TECHNOLOGICALLY ADVANCED FERTILIZERS**	✓ **Sustainable development of organic farming** (design and improvement of relevant infrastructures) ✓ **Development of human and institutional capacities in the field of agriculture** ✓ **Support to sustainable development of rural communities** (volunteer programs to promote good agricultural practices among agricultural exporters and consultants on soil erosion, soil organic matter, soil structure, minimum level of protection) ✓ **Promoting digital agriculture and technological innovation** (digital innovations, such as improved varieties, new pesticides / herbicides, solar autonomous grid systems, greenhouse construction materials, anti-hail grids, soilless, no-till and vertical cultivation systems	**P1** **P2** **P3** **P9**

REDUCTION OF EMISSIONS FROM ENTERIC FERMENTATION **IMPROVEMENT OF FEEDING PRACTICES,** **SUPPLEMENTS AND ADDITIVES,** **HERD MANAGEMENT AND BREEDING**	✓ **Improving the quality of seeds and seedlings, promoting use of modern practices for animal breeding** (intensification, herd management and breeding) ✓ **Sustainable development of organic farming** (design and improvement of relevant infrastructures) ✓ **Development of human and institutional capacities in the field of agriculture**	**P1** **P2** **P3** **P4** **P5**
SEQUESTERING CARBON IN AGRICULTURAL SYSTEMS **CARBON MANAGEMENT IN PLANT SYSTEMS,** **AGROFORESTRY,** **IMPROVEMENT OF CARBON STORAGE IN PASTURES**	✓ **Development of human and institutional capacities in the field of agriculture** ✓ **Support to sustainable development of rural communities** (volunteer programs to promote good agricultural practices among agricultural exporters and consultants on soil erosion, soil organic matter, soil structure, minimum level of protection) ✓ **Promoting digital agriculture and technological innovation** (digital innovations, such as improved varieties, new pesticides / herbicides, solar autonomous grid systems, greenhouse construction materials, anti-hail grids, soilless, no-till and vertical cultivation systems	**P1** **P2** **P3** **P9**
MANURE MANAGEMENT **MANURE - A SOURCE OF ENERGY AND NUTRITION FOR CROPS,** **STORAGE AND HANDLING PRACTICES,** **DIETARY CHANGE** **DIVERSIFIED FARMING SYSTEM**	✓ **Development of human and institutional capacities in the field of agriculture** ✓ **Promoting digital agriculture and technological innovation** (digital innovations, such as improved varieties, new pesticides / herbicides, solar autonomous grid systems, greenhouse construction materials, anti-hail grids, soilless, no-till and vertical cultivation systems	**P1, P2** **P3, P4** **P5, P9**

- The practices that are included in the Sustainable development Package are overall reflected in the Strategy. At the same time, state assistance programs (7 out of 9) have a considerable potential in terms of enabling development in these areas. Human and institutional capacity building can ensure effective implementation of other priorities as well as the assistance programs.
- Improving nitrogen fertilizer management package is mainly covered in terms of practices where the equivalent strategic priorities are predominantly future-oriented initiatives. Basically, this "burden" will be borne by policies promoting digital farming and innovative technologies and sustainable development of organic agriculture.
- Known practices to reduce enteric fermentation are reflected in the Strategy in aggregated form. More specifically, the document sets priorities in certain directions, which should presumably include those practices as well. In this respect is the existence of a livestock breeding development program is particularly noteworthy (another 4 assistance programs could have significant contribution), which carries a tangible potential to make progress following the same logic. It should be borne in mind that this is the largest segment in the National GHG Inventory accounting for agricultural emissions and therefore requires specific attention.
- Known practices under carbon capture strategy in agricultural systems are not directly represented in the Strategy scope. They would be capable of driving positive trend only by virtue of secondary effect, due to excessively generic context i.e. in the light of overall development and progress, which is largely dependent on the level of human and institutional capacity building.
- Manure management is one of the multi-layer mitigation strategies where the underlying practices require associated infrastructure and a certain level of technological pursuit. The relevance and effectiveness of this strategy will most likely be reflected in the later stages of the agricultural reforms envisaged by the Strategy, when advanced approaches are fundamentally embedded in livestock management practices.