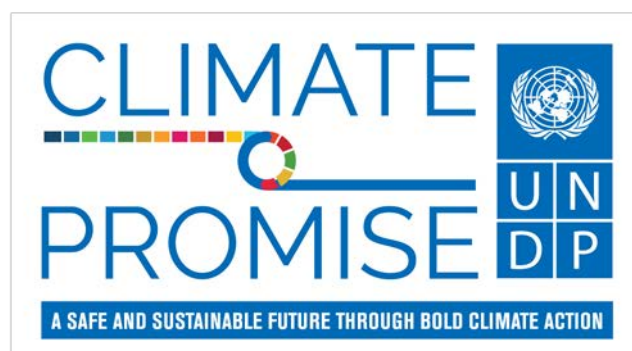


De-risking investments in North Macedonia's enhanced Nationally Determined Contributions

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De-risking investments in North Macedonia's enhanced Nationally Determined Contributions

Executive summary

North Macedonia's 3rd BUR and updated NDC contain a series of emissions reduction options and constitutes a comprehensive framework for the coming ten years of efforts to reduce emissions. The overarching prospect of EU membership will have a number of consequences for the investment landscape including the risk perception for investments in North Macedonia, but policy and regulatory changes will not come with EU membership; they will lead to EU membership. Therefore, the promise of becoming an EU member in itself will not contribute decisively to a de-risking roadmap.

The energy sector remains the largest contributor to emissions and most of the de-risking focus is likely to rest here. That is particularly relevant for the accelerated strategy to include private Independent Power Producers over the next 5 years.

The industry is likely to face strict EU regulation, particularly in the steel sector, and strategies for investment and their de-risking should be a priority, as they will support efficient implementation of the ambitious mitigation actions from the enhanced NDC.

In transport, the main risk is not constituted by investments, but rather political risks affiliated with restricting people's access to cheap mobility. While urgent action here would be desirable, only the worst vehicles can probably be screened off the roads through increased enforcement of vehicle permits and standards in the short term.

In the waste sector, the informal economy of North Macedonia is particularly active and must be included in any strategy that is to de-carbonize the sector. Explicit compromises between these operators and the public sector, which operates the formal systems, are necessary, together with cash flow guarantees, if investments are to be attracted here.

For the waste sector, few measures are needed in order to de-risk the proposed interventions, while in AFOLU there are generally no de-risking measures identified as necessary to move forward with the proposed initiatives.

In most sectors, there are initiatives in the updated NDC that do not require investor de-risking. Their weight in the overall de-risking landscape is surprising. Sixteen measures require 'inverse de-risking', meaning that they might pose a risk to the government - a political or reputational risk - compared to 19 measures that would require a more traditional investor de-risking effort. Among these, many risks originate in policy-makers' actions, and good governance in itself will reduce risk. This combined on the one hand evidences a significant responsibility for the Government to move policies forward, but also a substantial potential for emissions reduction actions that do not necessarily require investor de-risking prior to implementation. In addition, a few measures do not require de-risking at all, while some initiatives actually serve to de-risk other measures, especially those that require inverse de-risking.

Investor de-risking measures aiming at FDI entails another risk of disadvantaging the local industry, which may not be able to benefit from such measures. Keeping the local industry competitive is

particularly important especially in terms of measures that serve the dual purpose of emissions reduction and Covid-19 recovery. Among these initiatives are particularly the labour-intensive measures in forestry and energy efficiency.

North Macedonia already have important legislation in place that allows the consideration of specific de-risking measures under the Strategic Investment Law. This opportunity should be exploited wherever the law is applicable.

The prioritization of de-risking initiatives may succeed employing different evaluation criteria. Some measures fare well employing certain criteria, while other fare well under all. Five different evaluation are proposed including

- a) the potential emissions reduction benefit,
- b) the cost of de-risking,
- c) the nature of de-risking,
- d) the complication of de-risking, and
- e) the Covid-19 recovery co-benefit.

Evaluations of all measures have been prioritized according the these criteria, ultimately leading to a conclusion that 'prioritizing prioritization methods' may provide the best way forward, starting with Covid-19 recovery conducive measures, low cost de-risking and finally high emissions reduction potential measures, in the said order. Completing de-risking based on these principles will underpin Covid-19 recovery, while at the same time achieve of 82% of the projected emissions reduction from 15 out of the 21 analysed measures.

1 Background and introduction

UNDP North Macedonia has contracted UNEP DTU Partnership to analyse the possibilities for de-risking investments related to the implementation of North Macedonia's Nationally Determined Contributions (NDC) under the Paris Agreement on climate change. The Terms of Reference stipulate a number of activities that are ultimately to lead to the identification of a de-risking 'roadmap', implying that some de-risking actions precede others. It is the task of the team to consider which steps should be taken and in which order with a focus on energy (except renewable energy), transport, industry, waste and agriculture, forestry and land use change (AFOLU). An essential context is the fact that the EU gave its formal approval to begin accession talks with North Macedonia in March 2020. In this process, Macedonia is expected to gradually align its policies with the EU, which may influence priorities and modalities of interventions in the targeted sectors.

The list of activities stipulated in the TOR is a logical step-by-step approach to finally reach the objective of identifying potential de-risking instruments that can help the financing and implementation of emissions reduction actions as identified in the enhanced NDC, or beyond. Based on analysis of relevant national legal and strategic document, a peer review of the stipulated mitigation actions and proposals for corrective action or indeed the adoption of new technologies has been invited, but structural limitations linked to North Macedonia's starting point are also to be taken into consideration. Different barriers for progress in implementation of the identified actions are to be identified before work on a final de-risking roadmaps can begin. Generally, UNEP DTU Partnership has interpreted the Terms of Reference to cover four tasks:

- 1) Status and conditions present in North Macedonia
- 2) Potential avenues for additional mitigation action
- 3) Barrier and risk analysis
- 4) Identification of de-risking and financial support mechanisms

These are also considered to constitute a chronological order of the work to be carried out. The report starts with a presentation of risks in general and the current risk assessment in and of North Macedonia. It then moves to assessment of proposed initiatives in targeted sectors and subsectors as listed in the enhanced NDC before closing with more in-depth considerations regarding de-risking strategies in the form of a de-risking roadmap.

UNEP DTU Partnership wishes to thank UNDP North Macedonia for its support in providing access to information and stakeholders related to North Macedonia's 3rd BUR and enhanced NDC. UNEP DTU Partnership equally wishes to thank the stakeholders and experts in North Macedonia for making themselves available during the consultations.

2 North Macedonia's Starting Point and the De-Risking Rationale

In any given country, the development of de-risking strategies and instruments, and in this context for North Macedonia a de-risking roadmap, is naturally linked to the general investment level and climate. De-risking is traditionally seen as a means to comfort private investors, oftentimes foreign investors, not least in transition economies, where Foreign Direct Investment (FDI) is an important source of capital not only for productive investments in industry, but commonly also for infrastructure investment.

FDI has been one of the main pillars of the Macedonian economy and the government's efforts to create jobs. According to UNCTAD [2020 World Investment Report](#), net FDI flows to North Macedonia almost halved to USD 365 million in 2019, compared to USD 725 million one year before. However, 2018 was a tripling of the 2017 level, and the 2019 level of 3.8% (according to the World Bank) ranks North Macedonia 57th among 177 nations¹.

According to figures by the national bank, the main origins of investment in terms of FDI stock are the UK and Austria, followed by Greece, the Netherlands and Slovenia. The total FDI stock was estimated at USD 6.4 billion in 2019 with manufacturing having attracted most FDI, ahead of financial and insurance activities. So far, infrastructure has not been a main investment target.

When setting out to develop a de-risking roadmap for investments linked with North Macedonia's NDC, it is essential to be aware and acknowledge that its development will not succeed in isolation from many other activities that are now accelerating as a result of North Macedonia's EU accession process. As part of this development, there are many stakeholders, not least international, that will be looking at de-risking from different perspectives and in different contexts.

For instance, with specific relevance to its NDC, North Macedonia is required—as part of the EU Accession process itself and as a member of the Ministerial Council of the Energy Community (EnC)—to produce National Energy and Climate Plans (NECPs) in accordance with Regulation (EU) 2018/1999 of the European Parliament and of the Council. Also, the planned Law and Strategy on Climate Action is being informed by the European Union's 2030 Climate and Energy Framework and the Strategy for Energy Development of the Republic of North Macedonia until 2040 also fully integrates climate and environmental aspects of the energy sector, enabling overall energy sector modernisation and transformation in line with EU energy trends.

In this context, increased private sector investment is expected.

Also, substantial activity with multilateral finance institutions is underway. For instance, on November 17, 2020, North Macedonia and EBRD signed an MoU, the purpose of which is three-fold:

- strengthening private sector competitiveness and inclusive growth;
- sustainable infrastructure, the green economy and just transition, including regional connectivity priorities; and
- strengthening the investment climate and governance.

All three issues are relevant for de-risking and point 3 is directly overlapping. EBRD will not only engage in the development and improvement of conditions for investment. It is also likely to participate in many of them. To date, EBRD has invested €2 billion in 136 projects in North Macedonia. In addition, the European Investment Bank (EIB) has a long-standing record of engagements with North Macedonia, mainly for SME credit lines and waste water treatment in Skopje, and signed a €15 million credit line on December 16, 2020 for Covid-19 recovery. Also, the World Bank approved an Emergency Covid-19 Response project on April 30, 2020, as well as a Public Sector Energy Efficiency project on January 30, 2020, among others.

The development of a de-risking roadmap is therefore also likely to serve as a piece of a puzzle to establish an efficient synergy between North Macedonian EU Accession, NDC enhancement, Covid-19 response and the integration of already existing financial engagement by multilateral finance institutions.

¹ This number says little without context. In comparison, Albania is 7.86%, Bosnia & Hercegovina is 1.94%, Croatia 1.93%, Montenegro 8.35% and Serbia 8.32%. In the EU area as a whole, FDI makes up 1.23% of GDP.

The practical point of departure for this particular piece of work is North Macedonia's NDC and the list of actions included within. To most, this may not seem intuitive, the Covid-19 recovery being an extraordinary and urgent situation requiring unprecedented fiscal efforts and the EU Accession holding the promise of reshaping North Macedonia's future. However, recognized already during the financial crisis in 2008-09, there is an obvious synergy between economic stimulus and climate action, not least because the implementation of a number of climate related technologies are labour intensive efforts. That goes for renewable energy installations like wind energy and solar PV, both small and large scale, and energy renovation of buildings and industrial installations.

Like most other countries, the European Union failed to make a 'green recovery' from the financial crisis ten years ago. This time, in order to recover from devastating economic and financial effects of Covid-19 and bring back economic activity and jobs, the EU is building on the already negotiated European Green Deal, a €750 billion European recovery package (called Next Generation EU), and the €1 trillion Green Deal budget, which will be spent only on projects that meet certain green criteria. Twenty-five percent of all funding will go specifically to climate change mitigation.

In addition, even before Covid-19 struck, the EIB observed that over the past decade North Macedonia's investment in infrastructure has been the smallest in the western Balkans as share of the public budget, standing at 6.2% in 2018, down from 10.8% in 2008. According to EIB, the shortfall on infrastructure investment, particularly energy and transport, is a serious impediment to growth in the region and particularly in North Macedonia. At the same time, energy and transport are central to reducing North Macedonia's GHG emissions and constitute important areas of focus for EU Accession.

Thus, in tandem with the EU approach to recovery, North Macedonia's enhanced NDC is a catalogue of policies and measures, the majority of which have the potential to serve all purposes, integrating covid-19 recovery with multilateral finance priorities and EU Accession. Hence, it emerges as a package of investment opportunities, where the addition of a de-risking roadmap may have immediate impact. From that perspective, this point of departure is as good as any.

2.1 Why De-risking?

Setting out to develop a de-risking roadmap signals that investment risks have been identified as an obstacle to desired investments. Secondly, it indicates that the expected investor is a private entity, possibly but not necessarily a foreign investor. De-risking is not the only financial instrument available to governments endeavouring to spur investment. Direct public financial support for infrastructure investment or support to cash flows are other options. Commonly, governments provide direct asset investment for road infrastructure with tolls only charged on larger-scale project. On a smaller scale, cash grants for energy-efficient appliances are often used. Support in the form of cash flows is common in energy in the form of fuel subsidies or as feed-in tariffs above the general grid electricity price.

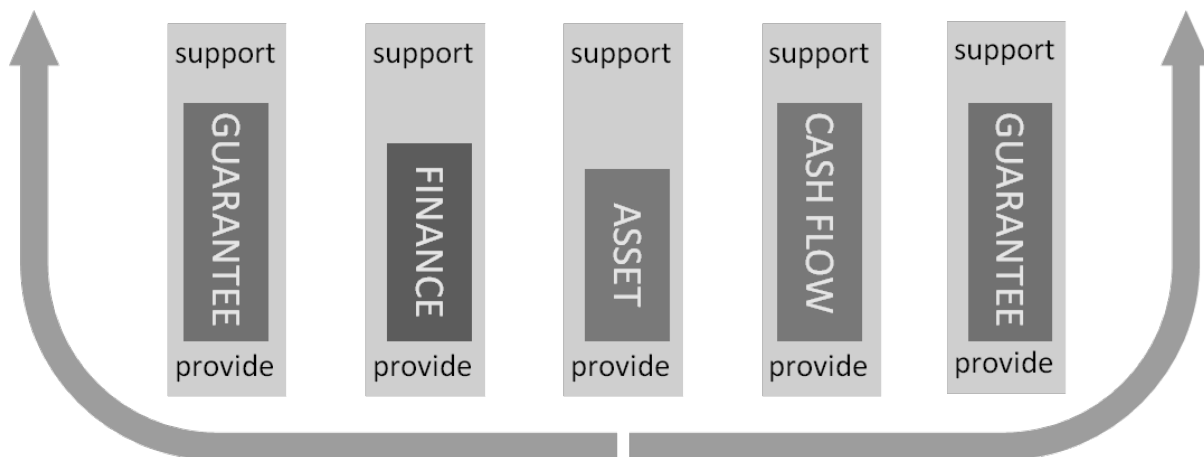


Figure 1. The financing value chain

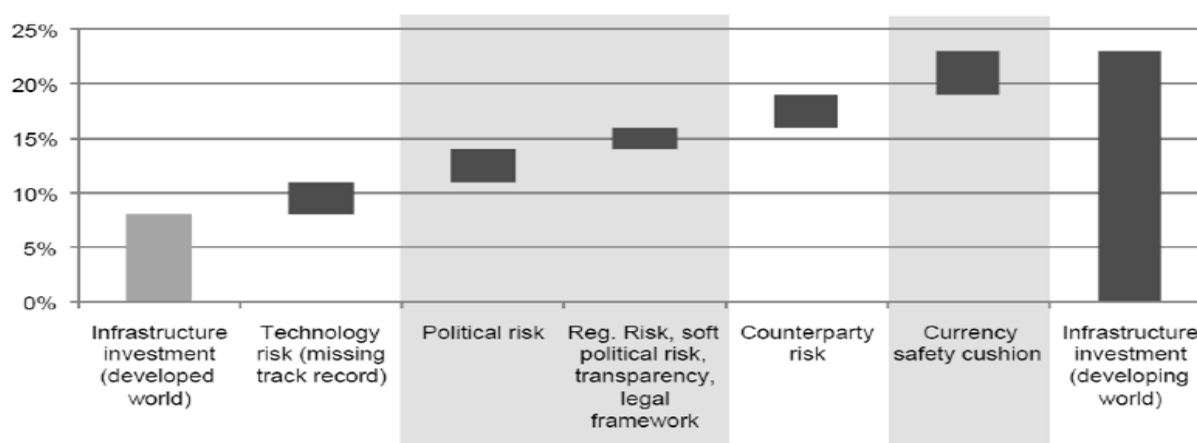
Different instruments come at different costs to Government as illustrated in Figure 1. The starting point is an investment in an asset, represented by the box in the centre. If the Government as the sole investor provides the asset (centre bottom of the figure), like for instance roads, this provides the least mileage (pun intended) from any given sum. Moving away from the centre, as well as upwards in the figure generally reduces the cost to Government. It also changes the identity of the investor in the asset from Government to a 3rd party, probably a private investor (or a corporatized, possibly foreign, utility like Austrian EVN having invested in electricity distribution in North Macedonia). It appears from the Figure that the provision of guarantees, or support provided to existing guarantors for their provision of guarantees (reinsurance), is probably the most cost-efficient strategy for a government to spur investment by others than the Government itself. Note that the figure illustrates principles and that a specific cost/benefit ratio cannot be extracted from reading the figure as a graph.

The other logic behind de-risking is that risks and uncertainties are costly for the economy, causing also the cost infrastructure projects and services to be higher than necessary. Figure 2 illustrates the cost difference between doing the same project in a developed versus a developing economy. The indicative percentages reflect required IRRs on investments, where different project risks cause projects in developing economy contexts to become up to three times more expensive to implement. The risk premiums for each category are of course only indicative and vary significantly among countries and to a lesser extent between sectors (technology). From a cost perspective alone, therefore, countries have an obvious interest in reducing the level of risk affiliated with (infrastructure) investment as high costs naturally have a limiting effect on the level of activity.

North Macedonia's legal and regulatory framework is generally favourable to foreign investors and provides numerous incentives to attract them. Investors benefit from a ten-year tax exemption on personal and corporate income and free access to public services. Labour costs are low, but on the other hand often there is a shortage of skilled labour. The country has made significant efforts to harmonise its legal framework with the criteria, standards and practices of the European Union. A number of challenges remain nonetheless, including especially corruption, lack of transparency, poor customer service, excessive bureaucracy, political interference in the judiciary, a lack of government capacity, communication difficulties and shortcomings in the rule of law and contract enforcement.

<https://import-export.societegenerale.fr/en/country/north-macedonia/country-risk-in-investment>

North Macedonia is not considered a particularly risky investment environment in international comparison. It ranks high— 17th place out of 190 economies— in the 2020 World Bank Doing Business report, after ranking 10th the previous year. That said, there are apparent sources of risk that may deter investors. The 2019 Corruption Perceptions Index provided by Transparency International puts North Macedonia at 106th place out of 180 economies (sliding from 93rd place one year earlier). In the adjacent text box, further challenges that foreign investors meet are listed. In addition to these, EBRD's Peter Tabak, Associate Director and Regional Lead Economist, says that EBRD's transition gap analysis² shows a great deal of room for improvement.



Source: DB Climate Change Advisors

Figure 2. The cost of risk

Competition from the informal sector and access to finance is a significant obstacle to doing business (more than in other Western Balkans economies), and to underscore Transparency International's assessment, "political connections also have a high impact when it comes to doing business in the country." Further, a transition to a green economy by increasing the share of renewables, lowering youth unemployment and increasing the labour market participation of women, as well as decreasing dependence on electricity imports, would all help North Macedonia in attracting investment.

Obviously, the latter do not amount to risks, but it does indicate that some of the proposed energy investments in the enhanced NDC may in themselves increase investor interest. The Macedonian enhanced NDC may reach up to 82% potential reduction of GHG emission by 2030 relative to 1990, but to achieve such ambitious targets, adequate interventions to de-risk systemic legal, institutional and financial barriers must be undertaken, not only for renewable energy investments, but for other central enhanced NDC related investments.

EU membership in itself has a substantial de-risking impact, which may be illustrated by the case of neighbouring EU Member Bulgaria. Despite North Macedonia clearly outperforms its neighbour with a 17th rank on the World Bank's 'doing business' website compared to Bulgaria's 61, and despite faring only marginally worse on civil oversight than Bulgaria in another comparison compiled by Transparency International, where instead it does better on doing business with government, its OECD risk assessment stands at 5 compared to Bulgaria's 3 (on a 1-7 scale where 7 is worst). This points to the effect of EU membership.¹ In other words, institutional de-risking is eventually bound to lead to further, inherent (or reputational) de-risking, thus again underscoring the interconnection between the

² <https://www.ebrd.com/documents/north-macedonia-country-diagnostic.pdf>

processes of EU Accession, Covid-19 recovery, NDC enhancement and multilateral financial engagement.

Table 1. Corruption perception Indicators (lower values are better)

	Rank	Risk Score	Domain 1: Business Interactions with Government (“Opportunity”)	Domain 2: Anti-Bribery Laws and Enforcement (“Deterrence”)	Domain 3: Government and Civil Service Transparency (“Transparency”)	Domain 4: Capacity for Civil Society Oversight (“Oversight”)
Bulgaria	69	42	48	28	41	35
Macedonia	77	43	41	31	40	53

Source: <https://www.oecd.org/corruption/integrity-forum/academic-papers/Tromme.pdf>

Therefore, it is probably not an overstatement that North Macedonia's investment climate is likely to benefit from EU membership. However, the improvements do not *come* with EU membership - they *lead* to EU membership. There is no doubt that the observed interruption of momentum in reforms in new member states in the late 1990s and early 2000s was a sobering experience for a European Union eager to expand its reach into Central and Eastern Europe. It is not one that is likely to be repeated. One of the common effects of EU membership, for instance, is that national Export Credit Agencies (ECAs) operating under OECD regulation, do no longer use country specific risk categorization for EU countries. The fact, therefore, that Bulgaria has a risk classification at all, as mentioned above, is not a sign of confidence in the reforms implemented - it is rather a sign of reforms still lacking.

In terms of overall financial standing, North Macedonia's fiscal space has been eroding since 2007, where public debt stood at 23% of GDP, to a level in 2018 of above 48% of GDP by 2018. The World Bank still considers this a relatively moderate public and publicly guaranteed (PPG) debt level, although the Bank sees risks in a possible decline in growth related to deterioration in the external, including sliding (or negative) growth in the EU, which is North Macedonia's main trading partner. This could dampen recovery of North Macedonia's economy, strain public finances and negatively affect the fiscal and debt consolidation agenda³, hence also limiting the space for publicly guaranteed debt. On the other hand, North Macedonia's public revenue collection mechanisms could be strengthened as tax collection is currently only 65% of the EU average rate. Increased tax collection might enable the government to increase fiscal spending on measures that could reduce investment risks; e.g., in capital-intensive projects like large renewable energy infrastructure, where feed-in tariffs have proven to be a key policy measure to de-risk investment.

Inverse de-risking

Particularly for infrastructure investment, it is important to consider both sides of the deal. The (private) investor must assess different aspects of risk affiliated with its investment. The (public) awarder of the concession must assess the risk of the deal, first and foremost the cost, but also the quality of the service. Historically, financially constrained governments have entered into agreements with private concessionaires on unfavourable terms, reflecting not only the price of being a poor country, but also costs of ignorance and the lack of good advice. Governments entering unfavourable deals face a triple challenge: 1) Paying too dearly for a service has the electorate displeased with the government's waste of financial resources; 2) terminating the contract will not only end the service, but may end up in costly arbitration, and 3) if the government violates its contract, it will deter other investors for years, rendering future deals either impossible or even more expensive.

³ World Bank Project Information Document - North Macedonia Public Sector Energy Efficiency Project (P149990), Oct 31, 2019.

In many investments relevant for the Macedonian enhanced NDC there are risks on both sides of the deals. **The Government must protect itself from entering into contracts that have the potential to bring it into dilemmas like the one presented above.** Governments, unfortunately, cannot take out insurance against commercial risks.

In the same category belongs political risks affiliated to programmes or investments that may disadvantage entrenched interests among certain stakeholder groups. Such risks may also evolve into investment risks, either for the government itself or for investors contracted to provide a service, in cases where popular dissatisfaction leads to abandonment of the initiative after its whole or partial implementation. One such example, not directly investment related, could be North Macedonia's wish to upgrade the national passenger car fleet, which is the oldest in Europe. **Accelerating the retirement of old cars may well inconvenience many owners of outdated vehicles potentially amounting to a political risk of intervening decisively in the sector.** Many of the initiatives in the enhanced NDC entail such political risks rather than investor risks.

2.2 Investor typology

If you owe the bank a million dollars, you have a problem. If you owe the bank 100 million dollars, the bank has a problem. - Popular saying

Different types of investors represent different risk profiles, and they invest in different kinds of projects - and they require different kinds of de-risking. North Macedonia's adoption of the Law on Strategic Investment (on January 20, 2020) is an example of an investor approach that considers investors based on the size of their potential investment. In line with directives of the European Union, it is designed to encourage, attract and create conditions for conducting strategic investments.⁴

The law defines investments as strategic if they are in the amount of

- at least EUR 100 million on the territory of at least two or more municipalities,
- at least EUR 50 million in the municipalities with seat in a city, municipalities in the City of Skopje, and the City of Skopje, and
- at least EUR 30 million in municipalities with a seat in a village,

or are conducted and financed in collaboration with the European Union, international financial institutions, or the Ministerial Council of the Energy Community (PECI–Project of Energy Community Interest; PMI–Project of Mutual Interest). Further, they must be in line with the strategic priorities of the Government of North Macedonia, which is considered inherent in investments proposed in the enhanced NDC, including energy and infrastructure, transport and telecommunications, manufacturing, agriculture, forestry and water economy, and wastewater and waste management.

Strategic investments materialize through public calls for applications for determining the status of a strategic investment project. A Commission for Strategic Investment Projects formed by the Government decides upon the applications. Once the Government grants a project this status, it proposes a draft law for the implementation of the strategic investment project to the Assembly of North Macedonia. After the Assembly adopts this law, the Government concludes an agreement with the strategic investor. The agreement with the Government, among others, should contain the assumed rights and obligations of the parties and deadlines for their realization including any and all

⁴ [Law on Strategic Investment](#) Karanovic & Partners on Law on Strategic Investment

state aid, subsidies, tax breaks, and other benefits, all of which must be in accordance with the Law on State Aid Control.

Hence, with this instrument the Government is in a position to specifically determine the financial conditions over which the government has control. It does not depend on generic statutes, but may devise, **within the limits on State Aid Control**, subsidies, write-off or takeover of debts, exemption, reduction or postponement of payment of public taxes, and granting loans and guarantees under favourable conditions. Generally, the purpose of such measures translates into higher rates of return on investments favoured by state aid grantors under the Law, in particular in the case of sale of stocks, buildings or land owned by state aid grantors.⁵

While this Strategic Investment framework potentially may offer strategic investors, including foreign investors, attractive conditions, including de-risking instruments, it also underscores what observers consider an uneven playing field. **While foreign businesses receive special treatment and subsidies in free economic zones or technological industrial development zones (an important source for the World Bank's assessment of doing business in North Macedonia and a contributing factor to its relatively high ranking), local SMEs often face a much more difficult business environment. In direct competition, the local companies may not prevail, and what may be attractive to foreign investors may be distortive detriments to the local industry.**

In the same way, co-financing of investments by multilateral institutions is in and of itself a comfort factor for those private sector entities that are engaged in their implementation. Oftentimes, however, this is a comfort rendered mostly to foreign investors, not necessarily by design, but in implementation. The 'informal' de-risking rendered simply by multilateral participation may not benefit smaller investors or service providers.

2.3 Risk typology

While there are risks faced by parties on both sides of a contract, risks may also be classified as either political, financial or technical. This also reflects upon providers of risk cover. For a de-risking roadmap, distinguishing those risks that North Macedonia's government can influence is essential. Governments are rarely involved in technical risk cover, for instance.

Technical risks are generally manageable by project developers in collaboration with their technology suppliers, be it in the planning stages, through implementation and during operation. These two parties are at the same time also in the best position to address the technical risks. Unless the Government of North Macedonia, or any of its institutions is responsible for technical facilities that directly influence private investors' infrastructure projects, the technical risks *can be managed through existing market practices*. Even in cases, where a technical failure on the government side causes losses for a private developer, these will normally not be considered technical. In the energy sector, for instance, there would be many such situations where an IPP is depending on the technical infrastructure—grid and grid connection for instance—that determines if the IPP can deliver its power to the national grid. While this is a technical risk, it is normally dealt with differently, for instance through a 'take-or-pay' contract. In this way, a technical failure is in essence transformed into a contract risk, which is a political or financial. But obviously, under such circumstances the performance of the grid infrastructure becomes a technical risk with potentially significant financial consequences for the national grid operator, MEPSO.

⁵ [Karanovic / Partners \(2020\). "Law on Strategic Investment Adopted in North Macedonia."](#)

Another area of implicit technical risk is *skills shortages* in North Macedonia, which according to observers reflect shortcomings in the education system and the outflow of skilled workers. There are no quick fixes for this, but awareness of the issue and guaranteeing training opportunities for national staff when entering into contracts, particularly with foreign contractors, may alleviate the problem in the medium term. The Strategic Investments vehicle is a splendid framework for such measures.

Figure 2 further distinguishes between political and regulatory risk. The line between the two is somewhat blurred, as political risks mostly consider large-scale events, such as the shift to a government with distinctly different ideologies in Mexico, or (worse) the recent military take-over of the government in Burma. Historically, such developments can have very hard consequences for investors, foreign and domestic alike, particularly for infrastructure assets that may face the ultimate risk of nationalization. Commonly, however, general political currents materialize as regulatory changes and thus ultimately pose regulatory risks.

Investors prefer regulatory stability and transparency, and although the 'Doing Business' index of the World Bank places North Macedonia favourably, the 2020 Investment Climate Statements from the US State Department⁶ finds “the regulatory environment complex with frequent regulatory and legislative changes, coupled with inconsistent interpretations of the rules.” Also, the *transparency of the investment environment could be improved through a 'one-stop shop' instead of leaving investors to find their way through a number of separate pieces of laws and regulations.*⁷

Obviously, there is a dilemma between stability and rapid legislative improvements, many of which may be linked to the EU Accession process. In that context, the changing of rules must be as predictable as possible, for instance through automatic adjustment mechanisms (not necessarily anticipating the precise changes to the regulation, but ensuring automatic economic adjustments to agreements influenced by the changes; e.g. if tariffs go up or down, the duration of contracts could be adjusted accordingly). A conducive regulatory environment could also include the provision of constitutional guarantees or dedicated investment stability laws.

Legislation alone is not enough, however. *Laws and regulations need to be stringently enforced* by the country's executive branch, preventing unexpected and adverse administrative decisions as well as corruption. According to the US State Department, “businesses complained that lengthy and costly commercial disputes through the court system creates legal uncertainty. Numerous international reports note that rule of law remains a key challenge in North Macedonia, pointing to undue executive control over the judiciary and poor funding for administrative courts as major obstacles.”

The government must ensure a reliable agency set-up, with efficient procurement and permit processes that never compromise their integrity, as well as strong anti-corruption measures. Both investors and the government need to have confidence in the availability of an independent, timely and efficient dispute-resolution mechanism that administers the law.⁸

⁶ <https://www.state.gov/reports/2020-investment-climate-statements/north-macedonia/>

⁷ North Macedonia's legal framework is comprised of several laws including: the Trade Companies Law; the Securities Law; the Profit Tax Law; the Customs Law; the Value Added Tax (VAT) Law; the Law on Trade; the Law on Acquiring Shareholding Companies; the Foreign Exchange Operations Law; the Payment Operations Law; the Law on Foreign Loan Relations; the Law on Privatization of State-owned Capital; the Law on Investment Funds; the Banking Law; the Labor Law; the Law on Financial Discipline, the Law on Financial Support of Investments, and the Law on Technological Industrial Development Zones (free economic zones).

⁸ North Macedonia's legal system is based on the civil law tradition, with adversarial-style elements, and includes an established legal framework for both commercial and contract law. The Constitution established independent courts that rule on commercial and contractual disputes between business entities, and court

Financial risks comprise liquidity risk, funding risk, interest rate risk, foreign exchange risk, inflation risk and a few other financially related risks. Some of these remain in the sphere between the investor and his or her financiers, but most have links to the policy and regulatory environment through the contracts that govern the investor's services. Some may be covered specifically in such contracts, like foreign exchange risks and inflation risks, while others may be indirectly impacted by changes in regulations, such as funding (or re-financing) risks and interest rate risk. A liquidity shortage can have many causes, but it also risks being dependent upon the judicial system. For instance, if a technical failure on the grid prevents an IPP from selling its electricity, it may face liquidity shortage if a take-or-pay contract is not enforced. Thus, the origin of the risk is not necessarily how it ultimately materializes and is recorded by the investor. Ultimately, all of these risks materialize as costs.

The interchangeability between uncertainty and risk is not trivial. And as it appears from the above, many risks are intricately linked. The common feature of these risks is that they are concerned with changes, unpredictability, and lack of transparency. Per experience, government and governance issues are the most frequent source of all three.

2.4 Filling the gaps in risk cover

There are two main steps for improving conditions for investors through a de-risking roadmap. The first is to identify risks that are already sufficiently covered by existing institutions or may be reduced by normal investment structuring.

Currently, North Macedonia has 37 Bilateral Investment Treaties (BIT) in force⁹ providing investor protection through international commitment, the latest concluded with Denmark in 2016. Although many BITs have shortcomings, such as vague protection clauses and controversial arbitration procedures, the World Economic Forum suggests that countries consider increasing their involvement in equitable international commitments, employing emerging new standards and innovative clauses.¹⁰ Within the EU, however, development has moved in the opposite direction.

In the 1990s, Member States encouraged cross-border investments by concluding BITs with other European countries that have since joined the EU. However, in 2018 the Court of Justice¹¹ concluded that investor-State arbitration clauses included in those Treaties are incompatible with EU law. On May 5, 2020, 23 Member States¹² signed an agreement to terminate intra-EU bilateral investment treaties, at the same time calling on the Commission to explore further actions aimed at better ensuring complete, strong and effective protection of investments within the European Union.

Obviously, without a replacement of the BITs, some EU investors are reiterating existing concerns that the investment climate within the EU has been deteriorating over recent years, notably due to sudden

rulings are legally executed by private enforcement agents. Enforcement actions may be appealed before the court. The enforcement procedure fees were lowered and simplified in 2019. Disputes up to €15,000 (\$16,541 per 03/30/2020 exchange rate) require mediation as a precondition to initiating legal action within the courts. Cases involving international elements may be decided using international arbiters. Ratified international instruments prevail over national laws. (US State Department 2020)

⁹ <https://investmentpolicy.unctad.org/international-investment-agreements/countries/124/north-macedonia>

¹⁰ Mitigation of Political & Regulatory Risk in Infrastructure Projects Introduction and Landscape of Risk, World Economic Forum, January 2015

¹¹ Case C-284/16, Achmea

¹² Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia and Spain.

and unforeseeable changes in regulatory frameworks and loss of trust in the effective enforcement of their rights. Some investors also claim that due to the termination of intra-EU BITs, there will no longer be a level playing field between third country investors investing *into* the EU and EU investors investing *within* the EU; i.e., that third country investors are currently better protected.

In that perspective, at this particular time, foreign investors in North Macedonia—at least those covered by BITs—may at least operate under clearer rules compared to intra-EU investment. Their enforcement, however, remains a source of concern for foreign investors. For BITs, it is also essential that they are, per definition, bilateral. They do not pertain to national investors.

It is a commonly held belief among international investment lawyers that BITs may not necessarily be crucially important for foreign investment decisions. However, oftentimes they do reduce the price and increase the availability of Policy Risk Insurance¹³ (PRI), thereby reducing the transaction costs of conducting foreign investments. UNCTAD (keeping track of the BITs worldwide) is a staunch believer in this rationale, which has a logical basis. Backed by a powerful enforcement mechanism, BITs commonly provide foreign investors considerable legal protection against political risks, many of which are also covered by PRI. However, there is no empirical evidence to indicate any considerable link between BITs and PRI in practice.

Ultimately, therefore, within the framework set by the public sector, including BITs, the private sector must find ways of managing and mitigating the political and regulatory risk. For ultimate risks, such as expropriation or currency inconvertibility, companies can make use of financial instruments such as PRI or guarantees issued by multilateral organizations, national providers and the private market. These are 'investment protection' insurance products, which foreign investors may commonly resort to, but which are generally not accessible to domestic investors. In addition, political and regulatory risk may be mitigated through particular ownership structures. These may include international co-owners and co-financiers—such as multilateral development banks or institutions from an investor's home country—which may deter disrupting political interventions, or investment through joint venture models with local partners, which may lend a domestic 'feel' to the foreign investor.

If the ultimate political risk of nationalization pertaining to foreign investment is covered either by BITs, by PRI, or considered irrelevant considering its potential effects on EU Accession, then other types of risks to consider are those that at the same time reflect:

- 1) events generally assessed by developers as potentially costly incidents for which they would require a commensurately high-risk premium
- 2) events that are in full control of the Government and the cause of which can be eliminated at a low cost.

Eliminating such risks entails a 'risk cover dividend' and constitutes a real cost reduction to the economy. There are probably no governments that considers themselves a risk factor. Nevertheless, risk ratings in the form of credit ratings or as the above-mentioned OECD risk categorization are well established. Governments change, and priorities change with them. The more unstable or polarized the

¹³ PRI has been dominated by bilateral institutions, such as the US Overseas Private Investment Corporation (OPIC), or national Export Credit Agencies. Multilateral institutions, such as the World Bank's Multilateral Investment Guarantee agency (MIGA), have participated in the PRI market since the late 1980s. Private insurers first appeared in the early 1970s and experienced a dramatic growth in the 1990s. Today, private political risk insurers are concentrated primarily in the UK, USA, and Bermuda. The largest private insurers are Zurich American Insurance, Lloyd's, AIG, Chubb, and Sovereign. There are currently approximately 60 insurers operating globally that offer PRI. For further, see e.g. https://content.naic.org/cipr_topics/topic_political_risk_insurance.htm

political spectrum, the larger the risk is likely to be. It also takes time for the market, including observers, rating agencies and insurers, to change the perception of a given level of risk.

In North Macedonia's case, for investments that comply with the eligibility criteria, the Strategic Investment Law (SIL) may be a useful instrument, through which risks that meet both criteria may be (partly) mitigated. Among these risks are particularly those commonly mentioned by investors: frequent changes in the law or inconsistent application of the law. The Strategic Investment Law is considered central in this regard because it establishes a project specific legal framework including arbitration clauses, which potentially may even consider arbitration courts alternative to North Macedonia (although this would be a controversial step).

The SIL is considered a prime focus of the risk mitigation strategy and whenever relevant it is at the forefront of the de-risking roadmap as it is presented sector-specifically in the following. In contrast to the BIT and PRI this approach is equally relevant for both foreign and domestic investors. It may be considered temporary as it is linked to the SIL and is established case-by-case, but the contracts established under the SIL are (presumably) not renegotiated even if the judicial system catches up with the SIL provisions or if the legal framework moves in a different direction. However, the specific details of a SIL for any particular project has not been developed and would require details that are not at hand, including details on the contracting entities and on the specific implementation modality. SIL, therefore, is considered a de-risking element by its mere availability.

That said, not all is good. The Climate Policy Initiative (CPI) launched a series of risk gap analyses in 2013 stating that "currently, gaps in risk coverage hinder renewable energy investments. Risk — whether real or perceived — is in fact the single most important factor preventing renewable energy projects from finding financial investors, or raising the returns that these investors demand. It is also one thing that policymakers can cause, control, alleviate, or help mitigate."¹⁴ Even if renewable energy markets have moved significantly since then, developments in risk cover products have not kept pace.

Classical guarantees transform assets into liquidity through the intervention of commercial banks or other financial actors. Pension funds, for instance, or public (development) banks may also lend against a guarantee issued by an Export Credit Agency (ECA). The range of possible identities of the counterpart depends on the specific guarantee. There are guarantees without recourse to an exporter, a 'supplier's credit insurance' where an exporting vendor of a product offers his buyer a credit. He refinances this credit in his own bank through a credit insurance with an ECA. The opposite structure is a 'buyer's credit insurance' where the buyer draws a loan from his own bank to pay for the equipment. The ECA of the country where the equipment is bought offers a credit insurance to the local bank. These types of guarantees are also used in project financing structures and functions as a counterparty risk.

A third product is 'working capital guarantees,' which could be relevant for the financial engineering of an activity promoting a larger scale roll-out of a given technology, such as solar PV lamps in the hundreds of thousands or energy efficient pumps financed through a special purpose vehicle (SPV). Such guarantees may be available to experienced international Energy Service Companies (ESCOs), but they may also be established as dedicated windows under national Energy Efficiency Funds (such as the one contemplated for North Macedonia).

There are other guarantee products that are more focused on common commercial relations between supplier and client, such as exporter's bonds (covering the exporter's warrants towards the buyer in

¹⁴ Risk Gaps: First-Loss Protection Mechanisms, CPI, January 2013.

case of prepayment) and performance or warranty bonds (covering technology risk) that cover the buyer's unwarranted call of such bonds.

Hence, particularly for the foreign investor or supplier of technology, there is a plethora of risk cover options at different stages of project development. Many of the risks covered, however, originate with or have links to policy makers' actions as stated by CPI above. And risk covers are predominantly available to foreign investors.

2.5 Barriers and de-risking

Although de-risking has been defined as an important instrument for North Macedonia's quest to spur investment into activities encompassed by the enhanced NDC, it is not a silver bullet. It addresses some barriers, but not all. Essentially, it does not make up for bad business cases. An obvious example of this is the cross-subsidized consumer prices on electricity, meaning that households generally pay less than the generation cost of energy, while the remaining consumer groups pay more. This poses a serious impediment to investments in household energy efficiency or rooftop solar PV, both of which has to compete with lower-than-average power prices. The lower tariff, however, is constant and predictable. While it produces unprofitable business propositions, it poses no risk. Loss-making is certain and no de-risking instrument is going to change that.

However, in some cases—but probably not in the case of subsidized power tariffs—lack of profitability is a result of other factors, where de-risking can play a role as illustrated in Figure 2, for instance when specific risk factors render the cost of finance prohibitively expensive for a particular (type of) project rather than uneven market conditions. That could be the lack of track record for wind energy in North Macedonia, had that been a focus of the enhanced NDC, i.e., a technology risk.

It is a classical frustration of the renewable energy industry that not only has it had to compete with incumbent technologies, but also with subsidized energy prices, which have made new technologies unviable. Even if smarter financial models and de-risking instruments were to narrow the gaps, incumbents might resort to similar financial engineering. In most markets, eliminating subsidies is considered by far the most cost-effective way to attract investments in renewable energy and energy efficiency. But again, it is a financial barrier, not a risk.

3 A De-risking Roadmap for NDC enhancement in North Macedonia

North Macedonia is a non-Annex I country to the UNFCCC and thus in that context without quantified commitments for reducing its GHG emissions. However, under the Paris Agreement and through its initial Nationally Determined Contributions (NDC) North Macedonia voluntarily committed to emissions reduction to reach a level of 30% below 1990 emission levels by 2030. This in itself would be a significant achievement. However, in its 'Enhanced NDC' from 2020, the emissions reduction goal has been raised further to 51% below 1990 emissions by 2030¹⁵.

¹⁵<https://klimatskipromeni.mk/data/rest/file/download/060cb9db7eeedc24bae3c127f2afb7139283bec07324b04956c364a7e9868f2b.pdf>

The European Union (EU) gave its formal approval to begin accession talks with North Macedonia in March 2020. In this process, Macedonia is expected to gradually align its policies with the EU, including the EU Climate and Energy Policy. The EU has committed itself to emissions reductions of 55% below 1990 levels by 2030, measured as an average of all EU member states. Hence, North Macedonia's Enhanced NDC, corresponding to an absolute emission reduction in 2030 compared to BAU of 7,603 kTCO₂eq/year, ensures compatibility and comparability with the EU target.

North Macedonia's enhanced NDC and the 3rd BUR contains details of 46 planned actions (or focus areas of action) to mitigate climate change, each of which may be implemented at different levels of ambition, which are described in scenarios: WEM, WAM and WAM-e with the basic WOM¹⁶ as a static scenario where there are no changes in current technology or economics. WEM is effectively the BAU scenario, and WAM is 'with additional measures'. Scenario e-WAM signals even further ambition. *In most of these actions, the Government is not, or should not necessarily be, the prime investor.* However, the Government will be engaged in the establishment of the frameworks for their implementation. Implicitly, therefore, the Government must also consider to what extent it can alleviate the risks that investors may consider pertinent to Government involvement. The 46 actions of the enhanced NDC are organized under eight headings:

- A. Energy - Energy Industry
- B. Energy - Residential and Non-specified (Commercial and Service sector)
- C. Energy -- Manufacturing industries and construction
- D. Energy – Transport
- E. AFOLU – Livestock
- F. Land use and Agricultural subsector
- G. Forest and forestry
- H. Waste

With a few exceptions (renewable energy), the main analysis is structured according to this sector definition, evaluating each of the initiatives covered. The detailed analysis can be found in Annex A. The majority of the initiatives are within the energy sector, reflecting the emissions profile of North Macedonia, and many are within renewable energy, which is not covered by this de-risking exercise. Therefore, a total of 39 initiatives have been evaluated.

The presentation of the initiatives in the enhanced NDC does not include specific implementation modalities. As described above, however, the investment model is essential for establishing both risk and de-risking measures. Wherever plausible, the assumption is that initiatives are to be implemented with the assistance of the private sector. However, assumptions have had to go further than that. In some cases, the structuring of different components of initiatives have had to be assumed - or maybe rather proposed. This has been done not only to be able to identify possible risks, but also to isolate risk components. For instance, for initiative A-84 on waste management, it has been assumed/proposed that the construction of waste management facilities are discrete investments that may be implemented on a Build-Own-Operate-Transfer basis (BOOT or BOT), while concessions for waste collection are separate service contracts. The enhanced NDC does not venture into these details, nor does the National Waste management Plan identify who should invest in which structure; it only provides cost estimates of different system components. These assumptions may not reflect the

¹⁶ WOM = Without Measures, WEM = With Existing Measures, WAM = With Additional Measures and WAM-e = WAM extended

eventual implementation modality, but they are necessary to estimate risks and propose de-risking measures.

A general observation is that there is limited differentiation between components of the initiatives as presented in the WEM, WAM and e-WAM scenarios. Fundamentally, they are degrees of implementation of the same types of initiatives. Therefore, in terms of de-risking, they do not differ materially, and hence no distinction has been made. In practice, however, there may be a difference in the sense that larger projects tend to be more appealing to investors than smaller projects.

According to the enhanced NDC, 70% of the proposed policies and measures can be implemented with 'negative costs,' which in normal language means a profit (the term is an oddity from the past when addressing climate change was considered a cost by definition). These calculations, however, do not necessarily reflect the possible business cases. For instance, A-41 (large hydro), comes at a cost of € 9.5/tCO₂e, but it is already attracting investors. The cost of emissions reduction does translate into business cases and thus can only be used as an indication of the relative attractiveness of the emissions reduction options from a societal perspective, and then only in terms of emissions reductions; not in terms of the value to society of the core objective, be it energy production, waste management or transport services.

The hydropower projects obviously attract investors, because they are structured as business cases that come with a return on investment for the investor. Some of the initiatives cannot be framed as such. Others can, but the owner of the reduction option cherishes the freedom not to devote capital to invest in it. In those cases, the Government may impose action through regulation, but in doing so, the Government faces a reputational risk. It turns out that this pertains to a number of initiatives, where what is described above as 'inverse de-risking' becomes centrepiece.

3.1 De-risking overview

As mentioned above, the main analysis is attached in Annex A with a short overview captured in Table 2. It differentiates between risks to potential investors and risks to the Government (or the relevant public authority), mentioned earlier as *'inverse de-risking'*. *A surprising number of initiatives fall in the latter category, which on the one hand evidences a significant responsibility for the Government to move policies forward, but also a substantial potential for emissions reduction actions that do not necessarily require investor de-risking prior to implementation.* 16 initiatives fall in this category, whereas 19 require traditional investor de-risking. A few initiatives require no de-risking at all, or no risks were identified. Another observation is that 'inverse de-risking' initiatives represent about 30% of the total reduction potential (1286 out of 4273 tCO₂e/year).¹⁷ These are risks mainly related to setting standards to screening out substandard products from the market, be it appliances, light bulbs, or cars.

It would be natural to consider the cost indications of the initiatives relative to the efforts in providing de-risking or even the estimated marginal abatement costs. However, the cost estimates provided in the enhanced NDC do not all lend themselves equally well to such an exercise. For example, the shift from incandescent bulbs to LEDs and CFLs is estimated to cost about 1 billion € and have a high abatement cost of 61 €/tCO₂e. While this may reflect the investment cost it cannot reflect the energy

¹⁷ the number reaches 40%, if hydro is excluded - which it should be as it is a renewable source - and the info centres are included even if they pose no risk and a rather a source of de-risking in themselves.

savings, which normally provide one of the best returns on investment with payback times of oftentimes less than two years.

Also, it is a question of cost to whom. A de-risking strategy must have the purpose of shifting the investments to a third party, which will do so if the investments are profitable and offer reasonable risk/return ratios. From that perspective, the cost that is of interest is the cost to the Government of providing de-risking, assuming that the cost to the third party is considered an investment on which there is an acceptable return. As mentioned in Chapter 2, the Government should prioritize those potential no-cost de-risking options that come. Therefore, the table instead includes the emissions reduction potential, focusing on the emissions reduction possibly achievable through a given initiative and comparing this to the de-risking effort required by the Government.

Table 2. De-risking overview

Enhanced NDC ref.	Risk to		Main risks	Risk cover	2030 tCO _{2e}
	Inv.	Gov.			
A - ENERGY - ENERGY INDUSTRY					1073.4
A-40 transmission	√		Power: Technical risks to MEPSO. The investment is not an obvious target for 3 rd party investment	Keep this part of MEPSOs maintenance programme without inviting investors	323.4
A-62 district heating	√		Heat: Uncertainty on revenues with no compulsory connection to the heating network. Investors and operators have no means to secure revenues	Introduce compulsory connection where a heating network is available.	9.3
A-41 hydro power	√		Site geology and environmental issues	Government financed geological surveys, climate change risk assessment and EIA. BOT model with flexible term to reflect construction cost uncertainty. Ensure multilateral co-financing.	740.7
A-47 CO ₂ tax		√	Poorly designed implementation model	Development of Roadmap for the Introduction of a National Carbon Tax. Transparency on implementation modality and in-depth dialogue with industry.	n.a.
B. - ENERGY - RESIDENTIAL AND NON-SPECIFIED (COMMERCIAL AND SERVICE SECTOR)					1439.1
A-48 EEOS		√	The EEOS' contribution to emissions reduction is unpredictable	Ensure sufficient emissions reduction back-up from other more predictable instruments	162.8
A-50 appliance labelling		√	Potentially disfavoured local producers of inefficient appliances	Dialogue with affected producers	56.3
A-51 heat pumps	√	√	Sub-optimal technology implementation through single technology focus	Promote larger scale energy efficiency projects, e.g. through ESCOs.	392.3 (WAM)

			Private households may lack investment capital	Potentially include household loans in an EE Fund mandate (not recommended)	
A-52 EE info centers			No risks are identified. Instead, the centres may be considered part of de-risking on initiatives where information and transparency is suggested as de-risking		177.0 (WAM)
A-53 retrofit residential buildings	√		Technical and legal risks of changing the piping systems in housing blocks with no single legal entity as counterpart and no metered consumption.	Focus on single-owner housing blocks. Enter agreements with the heating company that realizes real savings on heat supply (alternatively the owner in cases where a central heating unit is used). Use flexible duration of Energy Performance Contracts. Avoid strict re-occupation permits. Provide commercial guarantees to ESCOs through a potential EE Fund.	49.0 (WAM)
A-54 retrofit centr gov. build	√		Energy bills may not be paid by the government department that owns the building.	Build-up the ESCO sector on this basis, which in itself helps de-risking the EPC market. Use flexible duration EPCs. Avoid strict re-occupation permits.	12.6 (WAM)
A-55 retrofit local gov. build	√				13.2 (WAM)
A-56 retrofit commercial buildings	√		Risks are identical to A-53	Focus on single-owner commercial buildings. Enter agreements with the heating company that realizes real savings on heat supply (alternatively the owner in cases where a central heating unit is used). Use flexible duration EPCs. Avoid strict re-occupation permits. Provide commercial guarantees to ESCOs through a potential EE Fund.	98.2
A-57 new build energy performance		√	Disadvantaging the local supplier base	Dialogue on standards and long-term transparency about future performance standards for buildings	19.8 (WAM)
A-58 passive build		√			17.0 (WAM)
A-59 LED and CFL		√	Potentially (limited) public dissatisfaction	Public information campaign	401.8 (WAM)
A-60 municipal street lights	√		Payment risks on municipalities	Billing through EVN and a guarantee window for ESCOs under the EE Fund, possibly requiring municipalities to take out insurance through a potential EE Fund	32.5 (WAM)
A-61 green procurement		√	Disadvantaging local suppliers	Public information on future standards. Dialogue with especially vulnerable local suppliers	6.6 (WAM)
A-62			See A-40		
C. ENERGY -- MANUFACTURING INDUSTRIES AND CONSTRUCTION					211.0
A-63 energy audits			No risks identified as long as there is no mandatory follow-up		67.8

			action for audited companies		
A-64 EE motors	√		Technical risks of production stops. Suboptimal project design. Commercial risks.	Set minimum standards for industrial appliances with motors as a 'no regrets' option. Include commercial risk cover for ESCOs in a potential EE Fund. Suboptimal project design may be avoided if energy audits (A-63) are accompanied by minimum standards (partially mandatory implementation).	14.9 (WAM)
A-65 advanced tech			Not sufficiently specific to identify risks	This may be considered at par with A-64 only for unidentified technologies	128.3 (WAM)
D. ENERGY – TRANSPORT					195.3
A-66 increased railway use		√	Non-achievement due to competition from private cars. Investment risks on network expansion.	Information campaigns and gradually increasing the costs of car ownership. Network expansion is hardly an efficient emissions reduction strategy	37.2
A-67 renew private car pool		√	Public dissatisfaction	Increased enforcement of rules for permits. Increase excise duty to at least minimum EU level	24.0 (WAM)
A-68 renew comm vehicle fleet		√	Business dissatisfaction	Information and health campaigns	64.0 (WAM)
A-69 advanced mobility	√	√	Non-achievement of objectives. Public dissatisfaction (parking). Private EV-rental services may fear changing regulations/permits	Information campaigns. Mildly inconveniencing parking. Guaranteeing minimum concession periods for EV-rental providers	3.6
A-70 railway to Bulgaria			This initiative is already financed with EBRD and EIB financing	Co-financing with EU grant financing - there is no commercial investment	24.6
A-71 transport electrification		√	Public dissatisfaction (increased CO ₂ taxes and green parking reservations)	Information campaigns highlighting the cross-subsidization in support of EVs. The few investments in chargers in highways do not merit a de-risking initiative	41.9 (WAM)
E. AFOLU LIVESTOCK, F. LAND USE AND AGRICULTURAL SUBSECTOR, AND G. FOREST AND FORESTRY					931.6
A-72 reduce enteric CH ₄		√	Dissatisfaction among farmers. Non-achievement	Information campaigns. Dialogues with local industry to produce the required feed types	35.0
A-73 reduce N ₂ O, dairy cows	√		Commercial risks on small-scale farmers. Legal risks on possible common SPVs	Introduce a levy on chemical fertilizer to finance a commercial risk guarantee for suppliers of technology. Introduce compulsory manure treatment	2.1
A-74 reduce N ₂ O, swine	√		Possibly energy market risks if manure is used to produce biogas		0.4
A-75 reduce N ₂ O, small dairy	√				0.7
A-76		√	Non-adoption		3.7

land conver. >15% inclin.				A swop-model using government owned land in exchange for fields on inclining terrain which are then afforested	
A-77 contour cult. 5-15% inclin.		√			20.0
A-78 perenn grass >5%			No-risks are identified		8.9
A-79 biochar for carbon sink			Premature for risk identification (except technology uncertainty)		110.0
A-80 PV irrigation			Renewable energy is not encompassed by this analysis		93.3
A-81 integr. forest management			This is a de-risking measure in itself, specifically for A-82		345.0
A-82 Afforestation 5000 ha	√		Forest fires, decease and pest. Counterparty risk on concession	Planting with fire breakers and secure distance to neighbouring poorly managed forests, if any. A-81 is an important de-risking measure. Possibly SIL for concession	312.5
H - WASTE					490.9
A-83 Flaring	√		Commercial contract risk if only flaring. Technical, legal and energy market risks if gas-to-energy	De-risking is probably not required for flaring. A carbon tax may drive investment. For energy production, introduce regulation imposing flaring and a specific feed-in tariff for biogas-based power. Technically, use container- based gas gen-sets. Include MEPSO in 3-partite concessions	489.7
A-84 MBT in new landfills	√		Limited counterparty risk (concession) for waste collection. Larger counterparty risk for BOT for waste management facilities	Include waste collection fees on utility bills to increase cost coverage. Expand waste collection to increase revenues. Separate waste management facilities into separate, public owned entity or a BOT-contract, possibly secured through SIL (if a network of facilities).	-12.2
A-85 paper waste	√		Competition from informal sector	Collaborate with the informal sector to monetize additional collection of valuable fractions if any.	10.1
A-86 industry waste	√				3.3

In the following short recapitulation, the focus is on the investment and financial de-risking, not the inverse de-risking for the Government. These options, however, are included in the de-risking roadmap in the following section.

Industrial and Residential Energy Efficiency (total 2512.5 tCO₂e, 1771.8 tCO₂e excluding hydro)

Within energy, due to the exclusion of renewable energy sources from analysis, the array of energy efficiency investment options stand out both in terms of emissions reduction potential and as a sector with particular potential for de-risking. The main instruments are the prospective EE Fund and the already existing Strategic Investment Law. This also includes the improved efficiency of electrical transmission.

The design of the EE Fund is crucial for the de-risking of EE investment, requiring the consideration of specific investment models relevant for the proposed initiatives. These include:

A-51	Heat Pumps
A-53, A-54, A-55, A-56	Retrofit of existing buildings
A-60	Municipal street lights
A-64	Efficient motors in industry

In addition, the EE Fund might play a role for the increased coverage of district heating networks (A-62). For industrial projects, it should play a role in A-64 as indicated, as well as probably in A-63 on Energy Audits.

For the design of the EE Fund, the experience with Armenia's R2E2 Fund is instructive. Being implemented by the World Bank, a stocktaking from May 2019¹⁸ identifies what worked and what did not. The first observation is that the Fund, with 1 million USD, was too small to engage in a stratification of its financing offer. Further, it attracted no additional government or private funds; it was depleted before returns (average 8 years payback time) became substantial; it resorted to on-lending, and it did not foster a local ESCO industry. It did achieve emissions reduction beyond expectation (150,000 tCO₂e which is a good leverage of the available funds), but it made only a tiny dent in the potentials, where it engaged (about 2%). Failing to make it a permanent feature of the EE landscape in Armenia means that the entire effort will eventually be wasted.

The initiatives listed for which the EE Fund would play a central role in North Macedonia represent 612.7 tCO₂e (already 4 times the achievement of the Armenian R2E2 and more than 10 times what R2E2 was originally set to achieve) or a third of the energy sector potentials excluding hydro. If the learnings from Armenia is anything to go on, it may well overachieve this, for instance by playing a role in A-63 Energy Audits where a ready financing offer is likely to improve uptake. But it requires a **reasonably sized Energy Efficiency Fund** (e.g. +50 Million USD) with at least a 15-20 years operational horizon to instil confidence in an embryonic ESCO industry that there is a long-term financial basis to establish a business on. This in itself is an **essential de-risking measure**.

It is central in that context to **ensure** that there is an **ESCO industry** that can utilize the offer of the EE Fund and that its establishment is directly promoted by the structure of the EE Fund. The EE Law is already an important step in that direction. Building experience of the EE sector is in itself a central piece of the de-risking, partly by building experience and expertise to provide confidence to the clients and partly by creating a professional interface between the financial offer, including de-risking windows, and the clients that is vetting the EE potentials as part of their bread and butter. In support of creating trust in this market, the Energy Agency requires ESCOs to register and thus undertakes to maintain a registry of active ESCOs, providing comfort not least for public sector entities when contracting with new service providers for energy services.

¹⁸ <https://ieg.worldbankgroup.org/reports/armenia-energy-efficiency-project-ppar>

The specific de-risking windows proposed for the EE Fund consist of:

1. Credit risk insurance on public clients

Accessible for ESCO on contracts with public clients covering the non-payment risk on Energy Performance Contracts. Ultimately, the credit risk insurance, if called, will draw on the sovereign guarantee and North Macedonia's central Government will need to consider means to recover the payments from the defaulting public entities. Over time, however, the financing extended by the EE Fund to the ESCOs must include a risk premium paid into this credit risk facility in order to make this instrument financially sustainable.

2. Liquidity risk insurance

An extended version of the credit risk insurance in cases where an EPC must be considered null and void (e.g. bankruptcy of a private client) and where assets technically owned by the ESCO are difficult (or impossible) to recover (oftentimes integrated in buildings or machinery). On public clients that (probably) cannot go bankrupt, extended duration of non-payment may have require the same type of risk insurance. It should be financed in the same manner as above or simply be considered as part of the same de-risking facility.

3. Policy risk insurance

ESCOs operate in a policy space recently created by the EE Law. It establishes a foundation for contracting with public sector entities. The law is, of course, subject to political initiative to potentially revise its provisions in which case the foundation for the EPCs may change. If such changes are retroactive, they may jeopardize existing EPCs and for that, a policy risk insurance is needed. This insurance should not be paid by ESCOs as a levy on the loans extended by the EE Fund. This insurance should be paid by the Government, which in effect it already is due to the implicit sovereign guarantee underpinning the EE Fund. ESCOs defaulting on their loans due to a retroactive policy change will thus in practice be covered by the sovereign guarantee.

In addition to these de-risking facilities, the EE Fund may offer loans with flexible repayment reflecting Energy Performance Contracts with equally flexible duration. Flexible duration EPCs address leakage, having occupants wasteful behaviour jeopardizing the efficiency gains of renovated buildings (e.g. it does not help to install thermostats on radiators if the preferred way to regulate temperature remains to open the window). Flexible duration EPCs allowing performance benchmarks to determine a (partial) extension of contracts if targets are not reached, should be mirrored by flexible duration loan agreements that allow ESCOs to retain their liquidity.

These de-risking facilities are equally relevant for all target interventions mentioned. In Annex A there are further details on priorities and intervention modalities within each initiative to ensure further de-risking. For the renovation of the built environment, these are mainly focused on circumventing the owner-tenant conflict of interest in energy efficiency investment.

Industry (211.0 tCO₂e)

Also within industry, the EE Fund is essential as indicated above. Energy auditing is commonly a central element and starting point for the provision of energy services and long-standing standards and protocols exist in that regard, specifically linked to the ESCO industry. It is therefore conceivable that the ESCO industry will be a strong promoter and ally in this initiative due to its inherent business perspectives for the sector. With the EE Fund specifically targeting the establishment of an energy

service industry, it should then consider whether particular instruments are needed in support of EPCs targeting efficient motors. In all likelihood, the three above-mentioned facilities should suffice. However, the EE Fund may want to consider dissuading single-technology interventions, such as a limited focus on replacing electric motors, which would limit the potential for optimizing EE potential. Single-focus programmes are efficient, but 'cherry-picking' renders the accompanying measures practically unviable once the 'cherries' are gone. For example, if a pump motor replacement programme neglects mending leaking pipes, these pipes will forever leak, as a later single-technology focus on leaking pipes will not be able to meet investment benchmarks as a stand-alone investment. Holistic investments may be a financing requirement by the EE Fund to avoid the risk of sub-optimization. This is equally relevant for other initiatives in the built environment, particularly with respect to heat pumps, which should not be allowed as stand-alone EE investments eligible for EE Fund financing.

Energy use in industry is less significant in terms of emissions reduction contribution, but that is conceivably because central sources of emissions have been omitted. The steel sector alone is responsible for about 377 tCO₂e of emissions annually with no clear avenue for its decrease despite that it is likely to be encompassed by the EU ETS and hence eventually a target for emissions reduction regardless of its omission in the updated NDC.

Such projects may be undertaken by industry itself, or industry may be serviced by specialized ESCOs. In some countries, like China, such projects are implemented on ESCO-like terms with private sector entities entering 6-8-year energy performance contracts (or even shorter). Oftentimes, however, such initiatives need to be encouraged, either through standards, such as the ones that North Macedonia is likely to be adopting as part of EU accession, or through direct regulation, mandating the use of the technology. Alternatively, measures would also benefit from the implementation of obligatory energy audits of manufacturing industries and enforcement of ISO 50001 standards, to push competitors into investing in energy efficiency technologies. These are self-contained projects in the sense that they do not require grid connection.

If implemented with ESCOs, such projects are based on complex contracts as there are de-risking requirements on both sides. These encompass construction as well as operation. Delays in construction has immediate economic consequences. The construction company/technology supplier is commonly able to produce such risk cover as it is central to its business. The actual performance of the technology during operation is another. Oftentimes, ESCO contractors compete on the duration of the contract. Therefore, flexibility on contract length is not a (likely) de-risking mechanism for the ESCO.

To pursue this sector, the EE Fund would probably need additional de-risking options, or it could leave these particular technology risks to be addressed by specialized and experienced technology providers with a track record.

Transport (195.3 tCO₂e)

Even a comprehensive programme in transport will achieve little in terms of emissions reduction. At the same time, most of the initiatives come with a reputational cost to the government and practically none of the initiatives require investment de-risking, potentially with the exception of an emission standard for commercial fleets if set with a deadline that requires the retirement of functioning vehicles. But less may be sufficient. A scrap premium may help decisions to purchase compliant vehicles. And the Green Procurement' initiative (A-61) may require all public transport services to be delivered with compliant vehicles. With no short-term compulsory retirement, an investment de-risking model is not required.

Overall, therefore, there are no investment de-risking measures considered for the transport sector.

AFOLU (931.6 tCO₂e)

Most initiatives in AFOLU require behavioural change among farmers and do not lend themselves to investment and thus not to investment de-risking either. Exemptions are the two forestry projects. As more than 90% of North Macedonia's forests are owned by the Government, the government itself (through its National Forests company) is central to de-risking, particularly in terms of reducing forest fires through the establishment of fire breakers.

In that regard, the management of the national forests is a particular de-risking measure for private investors in oak plantation adjacent areas, and the two initiatives should be seen in unison. The introduction of a specific insurance targeted private investors is unlikely to improve on what is already in the market for the forestry industry, but improving the framework conditions (and thus in all likelihood also the pricing of insurance products) by changing the national management practices of the forests seem to be a low or potentially no cost opportunity that does not require further financial de-risking.

For some of the Land Use Change actions, there may be needs for investment in irrigation by smallholders. This kind of investment may require specific de-risking for bank loans, probably with Government intervention with a guarantee product provided, for instance, through the Development Bank of North Macedonia as a simple credit risk insurance for the bank.

Waste (490.9 tCO₂e)

The emissions reduction potential in the waste sector, with the significant exception of methane flaring methane from landfills, is limited. With that exception, initiatives here should be considered a purpose in itself rather than emissions reduction initiatives. At the same time, the waste sector is complex and could require substantial efforts in terms of de-risking if offered for private sector investment. This is not recommended.

Apart from the flaring, all initiatives should be seen as one single waste management system where it makes limited sense to single out particular waste streams. Within the system, investment in facilities should be isolated from collection services, allowing private waste collectors to bring their own collection trucks, which need little de-risking (the service can be terminated immediately and equipment simply driven away if payments are not received). The public sector will remain responsible for fee collection and may integrate waste collection fees into general utility bills.

A national waste management finance programme may be established as a credit facility for municipalities or regions for investments in waste management facilities. In that structure, municipalities or regions become owners of the facilities. Private providers of waste collection services will be required use these facilities, and the informal sector will be affiliated to the recycling activities linked with the collection. The public sector will be responsible for the cash flows, including collection (through common utility bills) and distribution for debt service for the loan programme and the waste collection services.

This model requires little de-risking.

Flaring, on the other hand, is a low-cost option and should ideally be mandated by law, hence setting a cost baseline for landfill owners (presumably municipalities) in order for them to consider energy production from landfill gas. Concessionaires may install at least partially removable (container based)

gen-sets with the main fixed structures being only the wells, and hence might require less liquidity risk insurance. The existing feed-in tariffs for biogas-based power production may be sufficient as a basis for investment, but this has not been analysed, as it is part of the renewable energy sector.

3.2 A De-risking Road Map

Drafting a roadmap for North Macedonia's de-risking of climate change mitigation investments entails not only when the main areas of focus should be, but also the order in which they should be established.

At least four key questions should be considered when drafting such a roadmap:

- 1) what is the potential emissions reduction benefit?
- 2) what is the cost of de-risking?
- 3) what is the nature of the de-risking?
- 4) how complicated and thus how long will it take?

In addition to these basic issues, the Covid-19 recovery provides a very different parameter that may override traditional considerations. Recovering from Covid-19 has been mentioned earlier as a parallel to the recovery from the 2008-09 financial crisis, where the concept of investments in a 'green recovery' was first conceived as a perfect match of need and opportunity. In this context, it further proves to be a good guidance for a de-risking road map by letting particularly labour-intensive initiatives become priorities for de-risking along with other central investment priorities.

Considering these issues one by one, the attractiveness of different de-risking options may change. Five possible approaches are considered here:

1) **Considering the potential emissions reduction benefit**, the Government should simply prioritize initiatives that have significant emissions reduction potential.

From that perspective, seven initiatives should have priority (of which one is hydro power and strictly speaking does not belong on this list):

		ktCO ₂ e
A-40	Transmission Efficiency	323.4
A-41	Hydro Power	740.9
A-51	Heat Pumps	392.3
A-59	CFLs and LED bulbs	401.8
A-81	Integrated Forest management	345.0
A-82	5000 Ha Afforestation	312.5
A-83	Flaring	489.7
Total		3005.6

These seven initiatives at the same time require limited de-risking and may be promoted through other means as appears from Table 2.

2) **Considering the cost of de-risking**, the Government may be inclined to prioritize those initiatives that come at no financial cost, i.e., initiatives that may be promoted solely by actions of the Government. Many of these are initiatives that are labelled inverse de-risking options, i.e., initiatives that carry a

political risk to the Government. From that perspective, they may popularly 'be paid for in voters' if not implemented carefully. But there are also examples where one initiative contributes to de-risking another, like A-81 and A-82, and the information centres that may generally be helpful in securing popular understanding of the Government's motives and the reasoning behind initiatives.

From that perspective, a longer list of initiatives should be prioritized:

		ktCO ₂ e
A-50	Appliance labelling	56.3
A-52	EE info centers	177.0
A-59	CFLs and LED bulbs	401.8
A-63	Energy audits	67.8
A-70	Railway to Bulgaria	24.6
A-81	Integrated Forest management	345.0
A-82	5000 Ha Afforestation	312.5
Total		1385.0

The above initiatives come at practically no cost to the Government and even have limited if any inverse de-risking requirement. There are several domestic manufacturers of resistive heating appliances that may be screened out of the market and whom may require special attention and such cases can blow out of proportion if not handled appropriately upfront in dedicated dialogues. A-81 and A-82 are included here, because they are considered to form a risk/de-risking duo that may come at no cost to the Government, but they require a change of practice in national forest management to avoid forest fires. Further analysis is required to determine the cost structure of these measures—see Annex A for further considerations.

The emissions reduction potential is marginally larger than indicated from this type of initiatives, but it is of course not surprising that it is less than when prioritizing the largest reduction opportunities. Combining the two approaches, however, will be a package encompassing 11 initiatives that deliver 78% of the emissions reduction potential represented by the analysed initiatives.

3) When **considering the nature of the de-risking**, the Government could prioritize those initiatives that come with a 'de-risking dividend,' i.e., initiatives that have a direct, positive effect on the investment cost without representing a cost to the Government.

		Kt CO ₂ eq
A-60	Municipal Street Lights	32.5
A-62	District Heating networks	9.3
A-81	Integrated Forest management	345.0
A-82	5000 Ha Afforestation	312.5
A-84	MBT in new landfills	-12.2
A-85	Paper Waste	10.1
A-86	Industry Waste	3.3
Total		700.5

This assessment is difficult to make, but it focuses on areas where regulatory actions by the Government that are low or no cost options can lead to investment. For municipal streetlights, allowing billing by ESCOs through the power distribution company and not directly to the municipal project host is a simple regulatory measure that alleviates a credit risk (possibly this is already an option). Instituting

compulsory connection to district heating networks alleviates a simple commercial risk to investors in network expansion. As mentioned above, the improvement of forest management practices in publicly-owned forests may reduce the natural risks faced by private investors. And the structuring of investments and billing practices in the waste sector are no-cost reforms that may assist in bringing private operators into more efficient waste collection services. From an emissions reduction perspective, however, the latter is of limited consequence and generally this approach shows little emissions reduction potential as a way to prioritize efforts.

4) In terms of **complication**, or rather the ease with which de-risking can be established for different initiatives, this is an assessment that should be made by policy makers. What looks like regulatory quick fixes may be anything but due to other concerns and considerations. For many of the inverse de-risking requirements the means to alleviate risk is dialogue with the most affected stakeholders, like national manufacturers of technology that is to be disadvantaged or entirely screened out of the market. While a dialogue may be easy to establish, its potential political fall-out and its lengthiness is difficult to predict without further insights. An attempt to venture into these considerations is thus avoided here.

5) Covid-19 recovery as priority guidance

As already indicated earlier, the linkage between Covid-19 recovery and a green transition has been made in several contexts and was already on the table for recovery after the 2008-09 financial crisis. Many climate change related measures are perfectly suited for economic recovery, particularly those that are labour intensive due to the obvious direct job creation effects, but also due to their significant multiplication effects on national economies as opposed to the purchase of (imported) assets. In particular, energy efficiency¹⁹ and forestry are among the priority sectors in this regard and the list of initiatives that call for priority from this perspective is a different one compared to the earlier lists.

		ktCO ₂ eq
A-51	Heat pumps	392.3
A-53	Retrofit residential buildings	49.0
A-54	Retrofit centr gov. build	12.6
A-55	Retrofit local gov. build	13.2
A-56	Retrofit commercial buildings	98.2
A-60	Municipal Street Lights	32.5
A-63	Energy audits	67.8
A-81	Integrated Forest management	345.0
A-82	5000 Ha Afforestation	312.5
Total		1323.1

The construction of new buildings could be included here, but the establishment of new building codes and standards is a lengthy process that will yield little emissions reduction even in the medium term, whereas the retrofitting will have immediate effect.

The list again includes the A-81 and A-82 initiatives in forestry, but otherwise the initiatives focus on those actions that are targeted by the EE Fund and for which de-risking is suggested as an integrated part of the design of the EE Fund. In that respect, therefore, the de-risking effort may be considered part of an already ongoing process.

¹⁹ See a comprehensive analysis here: [ESCOs and the renovation wave](#)

4 Conclusion

A de-risking road map for North Macedonia may be drawn up based on different criteria for prioritization. From a list of five principles outlined, a 'prioritization of prioritization principles' is necessary to arrive at a final road map. Concerns other than emissions reduction may factor into this decision, and—as the general nature of emissions reduction (unfortunately) has shown in the past in terms of prioritization—it inevitably becomes a co-benefit secondary to other concerns and actions. In this respect, this decision could be subject to priorities dictated by EU accession or, probably more urgent, economic recovery from Covid-19.

From that perspective, actions that are labour-intensive and at the same time lead to short-term cost reductions are obvious candidates for immediate action. Several initiatives emerge as priorities from more than one perspective, which of course also should lead to broadening this focus, but from an overall economic perspective, it is suggested to adopt the priority principles in the following order:

- 1) Covid-19 recovery
- 2) Low-cost de-risking
- 3) High potential emissions reduction

Once these three prioritization principles have been deployed, 82% of the emissions reduction potential will already have been covered through 15 of 41 initiatives addressed in this analysis.

		ktCO ₂ e
A-51	Heat pumps	392.3
A-53	Retrofit residential buildings	49.0
A-54	Retrofit centr gov. build	12.6
A-55	Retrofit local gov. build	13.2
A-56	Retrofit commercial buildings	98.2
A-60	Municipal Street Lights	32.5
A-63	Energy audits	67.8
A-81	Integrated Forest management	345.0
A-82	5000 Ha Afforestation	312.5
Total		1323.1
A-50	Appliance labelling	56.3
A-52	EE info centers	177.0
A-59	CFLs and LED bulbs	401.8
Total		635.1
A-40	Transmission Efficiency	323.4
A-41	Hydro Power	740.9
A-83	Flaring	489.7
Total		1554.0
Grand total		3512.2

At the same time, the road map identifies de-risking options that are immediately accessible, either because they are already part of on-going processes, or because they require little in terms of de-risking. In the first group are particularly those de-risking options that fall within the design of the EE Fund, which is central to initiatives that serve as Covid-19 recovery, but also investment projects that

are already under preparation such as the hydro power project(s). In the second group fall investments that are parts of long-term maintenance, such as the transmission line improvements, which are not obvious investment objects for third parties, or more promotional activities for consumers or industry, e.g. through the info centres.

Obviously, there are actions missing from the list. Most of these are actions that fall in the category of inverse de-risking. Only two of the initiatives - marked in red - on the list belong to the inverse de-risking category, leaving another 14 in this category, notably the entire transport sector, for additional exploitation without the need to consider investment de-risking, but rather consider the strategies for political de-risking. How these are prioritized requires a political assessment, which is not made here.

Also omitted are those options that exist in the industrial sector, especially in iron & steel and cement, which are entirely omitted in the updated NDC for no obvious reason as emissions reduction initiatives in these two highly emitting sectors are not only profitable, but also slated for inclusion in the EU ETS, which will ultimately require action. The initiatives are not included in the de-risking prioritization, simply because they are not even included in emissions reduction efforts. But they should be.

North Macedonia is in a good position to follow through on the de-risking roadmap by exploiting already on-going processes. If anything, the above prioritization highlights the urgency of establishing the EE Fund and affiliated de-risking mechanisms as suggested in this report. The next step is to consider who does what and when. Based on the above prioritization, the following actions should be taken by the relevant line ministries:

- a) The establishment of the EE Fund, emphasizing attention to the de-risking elements that have been suggested above. That includes not only the financial instruments, but also an active promotion and engagement in supporting the development of an energy services sector that can take advantage of the financial offers provided by the fund. Several ministries would be involved in this, including the ministry of Finance, the Ministry of Economy and the Ministry of Finance.
- b) The cross-cutting focus on the forestry sector regardless of which priority mechanism is employed to guide a de-risking roadmap points to a decisive effort by the Ministry of Environment to engage with the National Forest enterprise Makedonski Sumi. It is understood that the efficient operation of the forests is a long standing issue. This de-risking roadmap adds another two priorities to the urgency of addressing the issues pertaining to forest management, namely Covid-19 recovery and a significant emissions reduction potential that can be achieved at low to no cost de-risking efforts. This comes in addition to an EU focus on the sustainable management of forest resources.
- c) There is a set of standards and regulations that may be initiated in the short term by different ministerial entities. Energy audits should be mandated the Ministry of Economy and may already have a foundation in the EE Law. It will add to the market development for an embryonic ESCO industry. The labelling of appliances requires an early adoption of (recently updated) EU regulation in this area. This is also the responsibility of the Ministry of Economy. Phasing out incandescent bulbs and replacing them rapidly with CFLs and LEDs is another urgent action that can be implemented by the Ministry of Economy with no investment de-risking efforts required.
- d) Finally, the methane flaring in landfills, with a requirement to utilize landfill gas for energy purposes, can be set in motion by setting a deadline for mandatory implementation of flaring facilities in existing landfills. This is the responsibility of the Ministry of Environment and Physical Planning. It is intended to establish activity in the sector, exploring the interest of the private sector to establish methane extraction for commercial energy production purposes, ideally relieving the municipalities from the burden of investment. However, it is a process that

must be initiated early on to establish a basis for evaluating the feasibility of this addition to landfill gas flaring.

These initiatives are a first indication of actions that can and should be taken in the short term to utilize the enhanced NDC as a vehicle that serves not only North Macedonia's emissions reduction efforts, but also serves the purpose of economic recovery from the Covid-19 pandemic. Further detailing is obviously required and must succeed in sector/activity-specific contexts.

ANNEX A

1 Energy

In 2016, North Macedonia's final energy consumption (end use) was accounted for by oil products (49%), followed by electricity (29%), biomass (10%), coal (7%) and heat and natural gas (4%). The electricity sector accounts for 51% of total national energy sector GHG emissions and is likely to increase as a share of final energy consumption, in line with longer-term and economy-wide transitions to 'electrify' energy-intensive applications including transport, cooking and heating which are currently dominated by oil and biomass-based technologies.

The electricity sector holds the greatest potential for future private and foreign investment in the energy sector, especially as the country gets closer to - and eventually joins - the European Union

On the supply side, the electricity market will also attract a diversity of technology suppliers and project developers, assuming that a range of Renewable Energy Technologies (RETs) will dominate the share of future generation capacity, combined with ambitious energy efficiency measures.

The Marginal Abatement Costs (MAC) curve included in the enhanced NDC indicate 'negative costs' for the WAM scenario²⁰, which sets 2030 as the target year and calculates a total reduction of 5.6 megatons of CO₂-eq, assuming all policies and measures are successfully implemented. The MAC calculations for the WAM indicate that almost 80% of these reductions can be achieved with policies and measures that have 'negative costs', meaning that the economic cost of the proposed measures are lower than those included in the 'Without Measures' (WOM) reference scenario. However, in using the WOM as the reference scenario, as opposed to the WEM, it is argued that the MAC calculations used in the TBUR for the WAM scenario are overly optimistic.

Also, the MAC curve calculations do not consider or price-in the range of political and regulatory risks that are crucial to successful implementation of the WAM scenario. In particular, it is crucial to map and manage the key risks facing foreign investors in North Macedonia's electricity sector, some of which are technology-specific, but mostly they are economy-wide.

In effect these political and regulatory risks translate into degrees of certainty about the 'rules of the game', especially for private and foreign investors, where a lack of clarity and/or lack of confidence in the stability of these rules will constrain investment or simply increase the demand for a higher financial return on investment (see Figure 2). Likewise, investments in energy efficiency face a number of similar risks, discussed here.

1.1.1 Energy Policies, Laws and the National Energy and Climate Plans (NECPs) process

In preparing for EU accession, a range of new laws and policies have already been adopted in North Macedonia, including for the energy sector. The regulatory framework for the electricity sector is informed by the Energy Act of 2018 and accompanying legislation. The law covers energy policy, electricity market structure and consumer protection. Policy documents include the 2030 Energy Development Strategy, which was adopted in December 2019, running up until 2040. Energy Efficiency is incorporated in the Energy Development Strategy, which is currently being updated, covering a 5 year period. The current strategy includes 45 specific measures across sectors and the enhanced NDC is fully aligned with the 'Green Scenario', e.g. the most progressive/optimistic. In turn, the Green Scenario

²⁰ The 'With Additional Measures' (WAM) scenario included in the TBUR, includes 32 measures or policies for the energy sector, compared to the 'With Existing Measures' (WEM) scenario.

is fully aligned with the draft National Energy and Climate Plan (NECP), with the following long term (2040) goals, which are to:

- Reduce total national GHG emissions by 61.5% against 2005 levels
- Reduce final energy consumption by 27.5% against 2005 levels
- Have 45% of final energy consumption come from RETs

To ensure alignment with the European Union's 2030 Climate and Energy Framework, the government of North Macedonia is working on an over-arching 'Law and Strategy on Climate Action'. The existing Energy Development Strategy is already aligned with this vision, since North Macedonia is a member of the Ministerial Council of the Energy Community (EnC) and as such is required to produce National Energy and Climate Plans (NECPs) in accordance with Regulation (EU) 2018/1999 of the European Parliament and of the Council. The NECPs aim to inform the development of long-term energy and climate policy objectives (in the case of North Macedonia the Law and Strategy on Climate Action) and to **increase public sector transparency and simplify bureaucratic processes, as a key measure to de-risk private and foreign investment in low-carbon projects**. With reference to the above, this is particularly sought for among (foreign) investors. North Macedonia started its NECP process in 2018, setting up a multi-stakeholder Working Group. The Ministry of Economy and the Ministry of Environment and Physical Planning lead the NECP process²¹.

The enhanced NDC lists links to North Macedonia's existing climate change and energy laws, regulations and decisions, summarised here:

- Energy Law (2018) (Official Gazette of the RM no. 96, 28.5.2018)
- Rulebook on energy balances and energy statistics
- Rulebook on the manner and procedure for monitoring the functioning of energy markets
- Law on Energy Efficiency (2020) (Official Gazette of the RNM no. 32, 10.2.2020)
- Rulebook on Marking Energy Consumption and Other Resources for Energy Products (2016)
- Rulebook on Renewable Energy Sources (2019) (Official Gazette of the RNM no. 112, 3.6.2019)
- Decree on the measures for support of the electricity generation from renewable energy sources (2019) (Official Gazette of the RM no. 29, 5.2.2019)
- Decision on the total installed capacity of the preferential producers of electricity (2019) (Official Gazette of the RM no. 29, 5.2.2019)
- Decision on the national mandatory goals for the share of energy generated from renewable sources in the gross final energy consumption and for the share of energy generated from renewable sources in the final energy consumption in transport (2019) (Official Gazette of the RM no. 29, 5.2.2019)

1.1.2 Structure and current status of the electricity sector

The electricity sector in North Macedonia is dominated by fossil fuel generation technology, primarily coal, and constitutes the single largest share of GHG emissions among all major sectors. In 2017, coal and natural gas-powered generation made up 69% of total electricity generation, with the rest mostly coming from hydropower and imports of around 1.8 GWh. Indeed, the grid emissions factor for North Macedonia has declined in recent years due to increases in imported electricity (much of which is generated from hydropower), which in 2016 accounted for 27% of final consumption.

²¹ It is worth noting that North Macedonia's enhanced NDC is aligned with and influenced by the *Law and Strategy on Climate Change* project, funded by the EC, which aims to deliver the over-arching Law and Strategy on Climate Action.

While the Government (Ministry of Economy) controls policy making, sector regulation and governance is more 'hands off', with a national Energy Regulatory Commission operates as an independent body that sets prices in the wholesale market and for end-users and issues licences for new projects, from generation through to distribution. In doing so, they are supported by a national Energy Agency that provides technical guidance to interpret and operationalise the national energy policy.

The ownership model of the electricity sector in North Macedonia follows a semi-liberalised structure, where the market was unbundled from a previously integrated structure in 2006. The national power distribution system is owned by EVN North Macedonia, a private entity, part of the Austrian-owned EVN Group. The national transmission system is owned and operated by MEPSO, under state control. The power generation market is also dominated by the state-owned company ELEM which is obliged to sell 80% of power generation to a consortium of EVN North Macedonia and EVN Electricity has been selected as the universal market supplier. The remainder power must be sourced from the 'free market', meaning contracts with private independent power producers (IPPs). The Energy Act aims to implement EC Directive 2009/72 with an ongoing process to fully liberalise the electricity market, seeking alignment with EU market structures and regulations. Specifically, national energy policy aims for the state-owned 80% share of market supply to decline annually until it reaches 30% by 2025, thus indicating a rapidly growing demand for IPPs competing in the power generation market. This includes the construction of large-scale hydro power plants, as listed as a possible mitigation measure in the enhanced NDC. It is not known whether these plants would be fully privately financed, owned and operated; mostly likely there will be a significant share of public financing, possibly from development banks such as the EBRD. Chinese investors may also be keen to expand a portfolio in European markets.

SPECIFIC INITIATIVES AND AVENUES FOR DE-RISKING IN THE ENERGY SECTOR

In the following is a listing of specific actions in the energy sector following the enhanced NDC, but approaching these actions mainly from the perspective of an investor's consideration of risk. It aims to direct the risk gap analysis towards those activities that are particularly relevant in this context as not all require or lend itself easily to risk mitigation. The references used to 'Tables' are references to the 3rd BURs Annex 6. The energy sector is divided under four headings as outlined above.

A - ENERGY - ENERGY INDUSTRY

The following initiatives refer to generation and distribution of energy. They do not consider demand side options.

Table A- 40: Reduction of Network Losses

Mitigation action: Reduction of network losses.

Main objective: Reduction of losses in electricity and heat networks

Description: Technical measures for reducing distribution electricity losses comprise of overhead lines replacement with underground (where possible), transition to 20 kV voltage level, installation of new transformation stations to shorten the low voltage lines, as well as automation and remote network management.

- ▶ Replacement old electric transformer with new transformers at 20 kV voltage level
- ▶ Reduction of the reactive power in the power network

For the heating sector, technical measures include continuous replacement of existing heat pipelines with pre-insulated ones and optimization of the substation operations through automatic control

- ▶ Rehabilitation of the hot water distribution network, replacement of the existing pumps in the heating substations with new energy efficient pumps and other measures for energy efficiency improvement (modernization of the SCADA system, integration of the distribution networks).
- ▶ Installation of modern equipment for regulation and monitoring in the heating substations for control and reduction of the consumed heat

A-40 consists of two distinct types actions, directed at national grid improvements and municipal heating infrastructure respectively. In a risk mitigation context, they differ fundamentally. Both, however, are probably encompassed by the Energy Efficiency Law adopted in January 2020.

Grid improvements

The national grid company, MEPSO, owns and operates the grid as a corporatized public entity. This includes the continuous upgrading in order to respond to growing demand, improve grid stability, ensure interconnectivity (including international connections). The emissions reduction projected stems from improving grid operation and avoiding losses and from this perspective constitutes an investment in energy efficiency. Traditionally, MEPSO undertakes these grid improvement investments on its own budget. In case this remains the investment strategy, risk coverage is not a central issue.

Should MEPSO consider an accelerated investment strategy with private sector partners, a private investment would need to be compartmentalized within the grid infrastructure, posing a challenge similar to classical ESCO investment. Within a grid infrastructure, the equipment must be placed under the full control of the grid operator and the investor, conversely, has no control. Nor can the investor retake possession of the equipment in case on non-payment, the investment thus posing a typical liquidity risk. The grid investment does not lend itself easily to a performance based payment model due to the integrated nature of grid operation and thus a simple financial leasing arrangement may be the most straightforward model.

A risk cover model is not urgent unless the 20-years investment programme is built on the assumption that private investors are central to a financing model. If so, a liquidity risk insurance on MEPSO should be contemplated. Such risk cover would be equally relevant to Independent Power Producers, which are envisaged for the increase of renewable energy sources on North Macedonia's grid.

Municipal heat supply

District heating in North Macedonia is confined to the city of Skopje, representing 9% of North Macedonia's heating demand. It is a target of the World Bank's North Macedonia Public Sector Energy Efficiency Project (P149990). According to the Bank, 'Balkan Energy Group (BEG) manages the largest part of the heating system in Skopje with total heat generation capacity of 443MW. The two other heat generation companies in Skopje are Energetika, owned by ESM AD with 96MW of heat generation capacity and Skopje Sever AD with 46MW heat generation capacity. All 620MW are based on natural gas-fired Combined Heat and Power Plants (CHPs). The district heating distribution network has about 12% technical losses. About 75% of the district heating demand is residential; 25% is public and commercial customers. BEG plans to invest in rehabilitation and expansion of the network but the expansion is still not defined. The company is facing challenges with keeping existing customers and acquiring new ones as it faces competition from alternative heating sources such as natural gas and thermal pumps.'

This is aligned with the definition of a specific initiative in the BUR, A-62:

Table A- 62: Increased use of central heating systems
Mitigation action: Increased use of central heating systems

Main objective: Reduction of local air pollution, as household heating is one of the main sources for local pollution. **Description:** Increased use of the existing central heating systems through the implementation of information campaigns for connecting new consumers, including those who have been disconnected from the system in the past.

This initiative aims to increase the cash flow of existing infrastructure that has become idle due to disconnection and thus represents stranded assets.

This description identifies a major investment risk for a long-term infrastructure investment such as district heating, parallel to that of highways, but at least in theory easier to manage. In transport, compulsory usage is unviable. There is always another way. In heating, however, users may be compelled to use a particular source of heat available in a given district. If usage is left at the discretion of the user, future cash flows are entirely unpredictable and investors would need to demand a significant premium, which further erodes the demand. The most efficient de-risking model in this context is compulsory connection, implemented in a transparent manner with a public pricing model that is open to benchmarking against alternatives; not as a way to eliminate the monopoly (because this is technically the establishment of a functional monopoly), but as a way to keep the monopoly vigilant. Depending on the size of a rehabilitation project, it may fall under SIL provisions, potentially providing a basis for establishing a legal foundation for compulsory connection.

Excluded from these observations are the long-standing considerations of ESM providing district energy to Bitola, Mogila and Novaci through waste heat recovery from the coal fired power plant REK Bitola. Contributing to this omission is that North Macedonia is considering the phasing out of coal usage, which would leave a potential investment in district heating without a heating source. KfW was showing interest in this investment in 2013. Reconsideration would require clarity on the long-term operation of the power plant.

Table A- 41: Large Hydropower Plants

Mitigation action: Large hydropower plants

Main objective: Increase of the domestic generation capacity from renewable energy sources

Description: Construction of new large hydropower plant

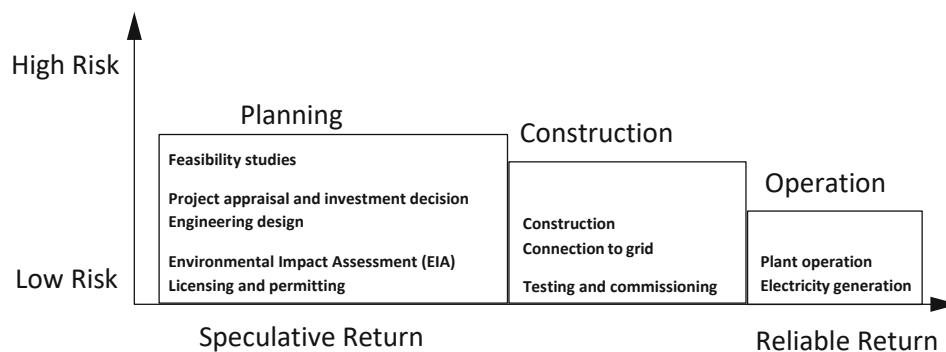
The construction of new hydropower capacity in North Macedonia is the main source of new generation capacity and is probably a necessary, although maybe not sufficient precondition in the short term for the phase-out of the REK Bitola plant's 675 MW capacity. Vardar Valley's 12 plants have a total of 320 MW planned; Chebren 333 MW (for which 10 international expressions of interest were received in December 2020²²) and Globochica 42 MW. The four planned hydropower projects are likely to require separate legislation through SIL or potentially other dedicated legislation due to their significance (Budget: 1.7bn €).

The investment projects face the classical risks - technical, economic, environmental, social, and regulatory risks, some of which are particular to hydropower. In this context, North Macedonia may be facing a risk that is difficult to mitigate. North Macedonia is highly vulnerable to natural hazards, including floods, droughts, forest fires, landslides, earthquakes and extreme temperatures that are amplified by climate change. According to the World Bank's North Macedonia Systematic Country Diagnostic (World Bank 2018) the flood risk is higher than in any other country in the Europe and Central Asia region. A major flood or earthquake disaster could derail economic growth, affect critical infrastructure, cause losses in agricultural incomes, and disrupt rural livelihoods. From other surveys in

²² <https://balkangreenenergynews.com/energy-giants-bid-for-north-macedonias-cebren-hydropower-project/>

neighbouring Turkey²³ it is apparent that the main risks are linked to site geology and environmental issues. A major risk mitigation effort thus may well be linked to the provision of in-depth, government funded geological surveys, climate change risk assessment for identified sites as well as providing the required Environmental Impact Assessments. While standard environmental impact assessments may have been enough in the past, the World Bank, EBRD and EIB now provide more detailed guidelines on required evidence. Mitigating negative environmental impacts of hydropower plants is vital to complete licensing procedures and to secure funding from these financiers. Conversely, the hydro projects may help mitigate the risks of flooding, a motivation behind many hydropower dam projects, e.g. the Three Gorges in China.

Some of the risks faced by the hydropower projects may not be mitigated. For the hydropower investor and financier, these are known risks. The Government may provide thorough analyses to reduce uncertainties that mainly relate to unexpected geology and sometimes significant cost overruns. As a back-up risk cover, **the government can provide flexibility on IPP contract terms by introducing an automatic extension of contract duration relative to cost overruns.** This is increasingly seen as a comfort factor for both parties, ensuring a collaborative approach to planning, constructing and operating the installations.



Finally, engagement of multilateral finance institutions in hydropower investments in itself provides a de-risking cushion for investors in such capital intensive infrastructure. Illustrative at the smaller scale is EBRDs controversy over the small scale 270 kW Krapska hydropower project, where the Bank has ended up in a mediation role between the developer, the government and environmental lobbies²⁴ equally playing a de-risking role for the Government in its dealings with a developer.

Table A- 42: Incentives Feed-In Tariff

Mitigation action: Incentives feed-in tariff

Main objective: Increase of the domestic generation capacity from renewable energy sources

Table A- 43: Incentives Feed-In Premium

Mitigation action: Incentives feed-in premium

Main objective: Increase of the domestic generation capacity from renewable energy sources

Table A- 44: Biomass Power Plants (CHP Optional)

Mitigation action: Biomass power plants (CHP optional)

Main objective: Increase of the domestic generation capacity from renewable energy sources

Table A- 45: Solar Rooftop Power Plants

Mitigation action: Solar rooftop power plants

²³ Handbook of Renewable Energy, DOI 10.1007/978-3-642-39487-4_5-1, # Springer-Verlag Berlin Heidelberg 20

²⁴ <https://www.globalcapital.com/article/b1f9j5v73l3zh6/ebd-urged-to-intervene-over-damaging-north-macedonia-hydro-project>

Main objective: Increase of the domestic generation capacity from renewable energy sources

Table A- 46: RES Without Incentives

Mitigation action: RES without incentives

Main objective: Increase of the domestic generation capacity from renewable energy sources

Table A- 49: Solar Thermal Collectors

Mitigation action: Solar thermal collectors

Main objective: Reduction of the energy costs and improvement of the efficiency

Activities related to renewable energy are generally not addressed here and therefore omitted from further considerations. However, some of the observations offered above on hydropower may be of relevance. Generally, the structure and implementation of the Feed-in Tariff policy in North Macedonia appears to be clear, which in itself is a de-risking factor for investment calculations, but it could be added liquidity risk coverage along principles mentioned for the hydropower projects.

Note that solar thermal collectors are included in the list here as being among the technologies encompassed by 'renewable energy technologies' and thus not addressed. The solar collectors are otherwise placed under 'Residential and Non-specified (Commercial and Service sector) Energy' in the list of actions in the enhanced NDC.

Table A- 47: Introduction of a CO₂ Tax

Mitigation action: Introduction of CO₂ tax

Main objective: Penalize the CO₂ emitters

Description: Introduction of CO₂ tax in order to stimulate the investments in RES and to increase the penetration of energy efficiency measures

The introduction of a carbon tax does not lend itself to de-risking, neither from a government perspective nor from the perspective of taxable entities. Prior to its implementation, however, its mere introduction may well be regarded a risk in itself by those targeted by the tax, as long as there is a chance that it may not happen. A CO₂-tax does entail the (mostly theoretical) risks of relocation or bankruptcy of carbon intensive industry, which in case this would actually materialize would signify that the tax had been poorly designed. Here, transparency is central and a consultative approach required, considering technological options for emissions reduction alongside assessment of international competition. As long as the carbon tax and its administration is predictable and stable, it poses no risk - it only predictably erodes a (smaller or larger) fraction of the profit.

A special report on the carbon tax has been developed by CCAP in this context.

B. - ENERGY - RESIDENTIAL AND NON-SPECIFIED (COMMERCIAL AND SERVICE SECTOR)

In the Residential and Non-specified subcategories 15 measures in total are modelled and analysed. All except one (A-49, which has been moved up to the previous section) are demand side measures, i.e. different forms of energy efficiency. They generally underpin the draft National Energy and Climate Plan (NECP), which has a long term (2040) goals to reduce final energy consumption by 27.5% against 2005 levels.

North Macedonia's Law on Energy Efficiency was adopted 6 February 2020. While it did not specify the establishment of an Energy Efficiency Fund, which has been in the works since 2013 with the help of the World Bank, it has paved the way for several energy efficiency actions including a legal framework for Energy Service Companies (ESCOs). The Law covers the following:

- 1) efficient use of energy;
- 2) energy efficiency policy;
- 3) the competencies of the Ministry responsible for the affairs in the field of energy and the Energy Agency for the implementation of this law;
- 4) the obligations of the public sector in terms of energy efficiency and consumption of energy;
- 5) the binding scheme and alternative energy efficiency measures;
- 6) energy controls of large traders;
- 7) energy efficiency in production, transmission, distribution and supply;
- 8) the performance of energy services and the ways of financing measures to support energy efficiency;
- 9) energy efficiency of buildings; and
- 10) marking of energy consumption and eco design of products that use energy.

It stipulates the obligation of all responsible entities, be it transmission and distribution companies or public sector building owners, to consider and estimate energy efficiency potentials from the operation of their assets. While this of course underpins a market, it does not necessarily remove market risks.

In terms of implementation, the provision of a specific legal framework for ESCO contracting equally is more towards underpinning an embryonic market than to remove risks, but it does provide welcome legal clarity. As such, it equally constitutes an element of de-risking. Another element of de-risking is provided by the Energy Agency taking an active role in regulating the ESCO market. It requires ESCOs to register and thus undertakes to maintain a registry of active ESCOs, providing comfort not least for public sector entities when contracting with new service providers for energy services. It is assumed that the Agency will operate this registry as a quality assurance measure and that ESCOs may need to qualify to remain on the list. If so, it is a de-risking measure.

For most of the energy efficiency investments related to the following initiatives, the assumption is that the investor is a third party investor and not the owner of the assets. For all means and purposes, therefore, the ESCO model is the point of departure for the evaluation of de-risking options linked to the initiatives. In some cases, however, like in the case of distribution networks, market risks affect the owner-investor and the 3rd party investor alike.

The ESCO sector is not yet well developed in North Macedonia. However, a professionalization of the energy service sector is a precondition for exploiting the significant energy efficiency potentials, maybe particularly for the public sector interventions, whereas the private sector may be more prone to use international service providers. Linking a professionalization of the local energy efficiency service provision to the establishment of the Energy Efficiency Fund would ensure not only a controlled way of developing the sector, but would equally be a de-risking measure in itself.

The Energy Efficiency Fund

Since 2013, the World Bank has been promoting the establishment of an Energy Efficiency Fund (EE Fund). With funding provided by the World Bank, it is financially self-contained and thus does not represent a net expense on the Government, although it does imply a sovereign guarantee. The EE Fund is a readily available, albeit still prospective source of funding for the energy efficiency interventions under North Macedonia's updated NDC. As with all sovereign lending, the implicit sovereign guarantee is a Government liability as long as the loan is standing compared to current account spending.

Other countries in the region have operated such EE Funds for many years. In Bulgaria, an EE Fund was established in 2006, serving mostly SME industry, public and residential sectors, with about 60% of projects in municipalities. The Fund provides loans to end users, portfolio loans to ESCOs, and loan guarantees. These projects are typically labour intensive actions on building renovation and exchange of outdated equipment. In Armenia, to support the build-up of an ESCO industry, an EE Fund similar to the one considered in North Macedonia uses simplified ESCO contracts to shift some performance risks to private construction firms and contractors. The congruence with the stipulations of the EE Law on the prospective provision of standard ESCO contracts is obvious and would/will be a further de-risking measure.

The establishment of an EE Fund may well be a vehicle to address a number of risks and barriers faced by investors in energy efficiency. Many of the initiatives in the enhanced NDC are targeted at the public sector, where many barriers are financial:

- a. Public accounting, budgeting and procurement rules that prevent public institutions from easy implementation and/or retaining the energy cost savings resulting from EE measures.
- b. Limited institutional capacities of government institutions, municipalities, and the private sector to identify and implement EE measures.
- c. Financing restrictions that have created considerable fiscal pressures on the availability of budget funds for investment in EE improvements.
- d. Limited borrowing capacity of municipalities, due in part to incomplete decentralization.
- e. Limited willingness of municipalities to borrow from commercial banks, due to prevailing high interest rates, MOF restrictions on debt, onerous application and reporting documentation to banks, etc.
- f. Limited interest of commercial banks in lending to the public sector, due to concerns over creditworthiness, insufficient available collateral, limited local revenue streams, etc.

The World Bank's proposed EE Fund is addressing the financial barriers c.-f. mentioned for municipal interventions, thus potentially unleashing significant activity in energy efficiency, provided the regulatory barriers can also be addressed. The enhanced NDC lists a number of building renovation activities in central government as well as municipal buildings, which are typical intervention areas for Energy Service Companies (ESCOs). It also includes the phasing out of incandescent lights, which historically and many places have been typical ESCO actions as part of entire building efficiency projects (i.e. not single technology renovation projects).

With specific focus on creating an ESCO sector, the EE Fund may extend its financing opportunities to other activities, including rooftop PV (both private, SME and municipal installations) or potentially solar water collectors. It is equally relevant for the improvement of street lighting in municipalities.

The EE Fund thus is an instrument that may become central for the development of the enhanced NDC energy efficiency interventions, not only as a source of financing, but implicitly also in terms of de-risking these investments.

INTERVENTIONS

Table A- 48: Energy Efficiency Obligation Schemes

Mitigation action: Energy efficiency obligation schemes

Main objective: Fulfilment of the obligation under Article 7 of the EE Directive
Description: To set up the scheme the average annual final consumption for the period 2014 – 2016 is used. The measure implements the possibilities from the Article 7 of the EE Directive to exclude the transport sector consumption (paragraph 1) from the sum of the average annual consumption and reduce the consumption in the industry sector (paragraph 2)

As the Energy Efficiency Obligation Scheme moves ahead as a consumer financed initiative, its actual implementation may rest on investment capacity among consumers. It is an initiative that is difficult to target with de-risking instruments, but it entails other risks mainly in terms of achieving its goals. Indeed, this is the main concern of those EU countries operating them. Not all EU countries operate an EEOS, claiming they can meet their energy efficiency obligations (within the Energy Efficiency Directive, EED - 2012/27/EU) through other means²⁵. The EEOS thus poses a policy risk to the Government itself and the main de-risking strategy would be to pave the way for achieving the energy efficiency objectives through other initiatives in parallel, like the ones listed below.

Table A- 50: Labelling of electric appliances and equipment

Mitigation action: Labelling of electric appliances and equipment

Main objective: Penetration of appliances with higher efficiency (class A++, A+, A, B) **Description:** Labelling of electric appliances and equipment to provide relevant information on the energy consumption of the products. The application of the labelling and eco-design of the products is necessary to ensure that the products sold in Macedonia comply with the EU regulations

Labelling of electric appliances is an administrative/regulatory initiative with practically no risks involved except possibly a policy risk of disfavouring local manufacturers of inefficient or even sub-standard (EU non-compliant) appliances. It is not known to what extent such production exists, except the LOEV Company and Dinamo HIT, which are both producing electric water heaters. These companies, however, stand to be hit by the following initiative - where it is less certain that the Ting-Inox company will be affected.

Table A- 51: Increased Use of Heat Pumps

Mitigation action: Increased use of heat pumps

Main objective: More efficient use of electricity

Description: Phasing out heating devices with resistive heaters, as well as inefficient biomass stoves and their replacement with heat pumps in compliance with EU Climate and Energy Policy

The phasing out of resistive heaters is a 'single technology' energy efficiency initiative and as such carry a technology risk of sub-optimization depending on a case-by-case assessment of the conditions under which the replacement of old technology succeeds. In most energy efficiency initiatives in the built environment (which is where heating devices are used), the replacement of the heat source is a central, but also commonly the most profitable investment. Investment in heat pumps oftentimes have payback times of less than five years. In fact, the more the building is leaking heat to the outdoors, the better the business of investing in a heat pump, whereas fixing the leakage is less profitable. Investments in improving the building envelope may have payback times of 10-15 years instead. Systems approaches to optimizing energy efficiency will combine these two, effectively letting the high profitability of the heat pump investment co-finance the low profitability of the building envelope investment.

Obviously, the technology risk here is that if the heat pump is taken out in a 'cherry picking' investment model, the building envelope will never receive investment and the heat pump will keep pumping heat into the outdoors.

Further, there is a policy risk affiliated with the fact that people may not want to let go of their favoured source of heating, be it biomass stoves or resistive heaters or other inefficient heating devices with which they are familiar. A way to avoid this is to refocus the initiative to the public sector at first, incorporating it in the following initiatives as part of general efficiency improvements in public buildings,

²⁵ <https://link.springer.com/article/10.1007/s12053-018-9657-1>

while campaigning for private households to adopt the new technology. That would be promoted by a short term technology ban, like the proposed ban on electric water heaters.

The proposed specific ban on electric water heaters, where the LOEV Company mentioned above is a domestic manufacturer, carries an immediate policy risk. While the company has other product lines, including solar water heaters (but also wood stoves), it will be directly affected. There may be other companies similarly influenced. Such policy risks, where manufacturers and the public may collude, can probably only be addressed through dialogue (which for instance could have the objective of bringing a company like LOEV into the ESCO business).

Private households are generally difficult to target with ESCO models. Investments are too small. And although payback times are generally short, households may choose to forego the profits themselves or in many cases lack the investment capital. Dedicated loan programmes may attract some, in which case a de-risking model for loan provision to households is (probably) required. Such de-risking may be provided through a window in the EE Fund targeted at local banks, but this would be a high cost (administration), high risk (defaults) and probably low yield (in terms of emissions reduction) measure.

Otherwise, a shortfall of energy efficiency gains in private households may be compensated for through 'contracts' with public sector entities for replacement programmes. These could form part of a drive to engage ESCOs in the EE initiatives pertaining to building energy efficiency, adopting systems approaches and avoiding 'cherry picking.'

Table A- 52: Public Awareness Campaigns and Network of Energy Efficiency (EE) info centres

Mitigation action: Public awareness campaigns and network of energy efficiency (EE) info centres

Main objective: Implement information campaigns that will raise public awareness about the importance, effects and benefits of energy efficiency

Description: Although a large number of campaigns for the promotion of energy efficiency by different stakeholders are provided, still there is a lack of knowledge about the benefits of the EE. Article 12 of the EE Directive stipulates that the country should take appropriate measures to promote and facilitate an efficient use of energy by small energy customers, including domestic customer. This can be done using different mechanisms. One of them is the establishment of EE info centres in the local self-governments. Following the examples from the EU, besides this measure, several others should be implemented such as:

- ▶ Education, starting from the kindergarten,
- ▶ Training of the employees in the public institutions at the central and local level,
- ▶ Creation of calculation tool that will show the financial and environmental effects from the implementation of a certain measure

No risks are identified in this context. The info centres are important, however, to help addressing the political risks affiliated to initiatives that, as described above, may not find immediate favour among the public. In that sense, the info centres may be considered a source of political de-risking.

Table A- 53: Retrofitting of Existing Residential Buildings

Mitigation action: Retrofitting of existing residential buildings

Main objective: To meet the requirements under the Energy Efficiency Law

Description: The measure considers reconstructions of residential buildings including windows replacement, initiated by the owners and/or supported by commercial banks and funds. This measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the reconstructions into operation.

Renovation of residential buildings has been a prime focus of energy efficiency projects in Central and Eastern European countries for thirty years. It faces several challenges, technically and legally, and thus for investors also pose several risks. Residential buildings are either fully owned by an investor, either

private or public (social housing), or it has mixed ownership, i.e. some apartments are occupied by the owner and some are occupied by tenants. All face different versions of the owner-tenant conflict of interest. Most renovation projects are focused on reducing heat consumption. For district energy in Skopje, this entails a change of piping model in housing blocks to allow for individual regulation of the heat in each apartment. Such technical renovation requires participation of all owners. Already here, many projects strand as not all owners have the same motivation to improve the heating system when heating is charged per square meter and not per calories consumed. Benefits are thus only measured in comfort. In addition to this, owners have little interest in investing on behalf of tenants that reap all the benefits from saving energy.

De-risking cannot resolve these dilemmas. Regulation may help imposing improvements, but if regulation is actually introduced, it comes with enforcement risks that any investor must consider. These would include legal obstacles in buildings with multiple owners with no common legal entity to enter agreements for building renovation.

The initiative, like all the following initiatives targeting building renovation, further mentions a certification as a 'prerequisite for putting the reconstructions into operation'. It is not clear how this is envisaged, particularly not for renovations, which could render buildings already in use unusable if a building renovation turns out to be sub-standard. The requirement seems only to be a feasible for new constructions. It is of course imaginable that building renovation is made compulsory and reoccupation only allowed upon certification, but this would be a drastic regulatory initiative the likes of which is probably only seen in Singapore. Unless compulsory, this may well be a risk that building owners are unwilling to run, unless the standard and the related evaluation system is transparent and reliable and the service providers, possibly ESCOs, are capable. The aforementioned ESCO registry may be helpful in that regard, but it is yet to be established. Hence, there is probably a sequence of introducing the components of this model in order to avoid creating unnecessary risks.

Here, it is assumed that building renovation will be for entire housing blocks, like the renovation that has already been undertaken with USAID assistance (ref. the enhanced NDC, 31 buildings for collective housing were renovated under the USAID/Habitat Project for residential energy efficiency). Only such would be of relevance for 3rd party investors, whereas single housing units would be for household investment. Some of the latter are already supported with government funds for specific investments²⁶.

Instead of targeting those parts of the sector that are hampered by other obstacles, de-risking should focus on single-owner housing blocks. These may be privately or publicly owned. Private contracting for 3rd party investors, typically ESCOs in this context, is normally legally uncomplicated, but owners have limited interest in investing due to the owner-tenant split incentives as mentioned above. Publicly owned social housing blocks is a more likely starting point where the public sector plays a central economic and financial role, including the one of supplying energy that is not paid for (in full).

In principle, a district heating company may consider a leaking building just another part of a leaking distribution system for which the company is already responsible. A public-public partnership for the renovation of building envelopes, possibly also the introduction of metered heating, may be a contracting entity for an ESCO that would optimize the energy consumption of a housing block.

²⁶ a total of MKD52.000,000 are provided as financial support for citizens including:

- MKD8.000,000 for reimbursement of part of the costs for solar thermal collector systems in households
- MKD22.000,000 for reimbursement of part of the costs for PVC or aluminium windows in households
- MKD14.000,000 for reimbursement of part of the costs for procurement of pellet stoves in households
- MKD8.000,000 for reimbursement of part of the costs for PV panels up to 4 kW for own consumption for households

Grouping both supply and demand in one structure eliminates conflicts of interest. Energy consumption payments remain the same, but the savings are not recorded as savings on the energy bill of the housing block. It is recorded as fuel savings at the district heating plant. A single meter for the housing block is sufficient to measure the savings, and thus enough to ensure a basis for the payment to an ESCO.

De-risking of such deal structures is relatively straightforward if the EE Fund is engaged and addresses the barriers listed earlier, including liquidity risks. A performance contract with flexible duration in order to accommodate uncertainties related to occupants' reaction to improved efficiency of a building block is a simple de-risking contract format. In terms of issuing permits of usage, this should not constitute an additionally created risk potentially preventing investments and should probably be approached rather as a certification system issuing energy labels as some countries have introduced in the same way as energy labels are used for appliances.

Table A- 54: Retrofitting of Existing Central Government Buildings

Mitigation action: Retrofitting of existing central government buildings

Main objective: Retrofitting of existing public buildings with aim to meet the objectives of the EE Directive and the Energy Efficiency Law

Description: Having in mind the situation with the energy performance of the public buildings at the central level and the role that they should play, it is essential to boost their renovation. Article 5 of the EE Directive is of great importance because it can be a starting point for the retrofit expansion. In absence of recent information about the public building stock, in the calculations, the heated area of building stock from the National Program for EE in public buildings (Draft version) is considered (including health care sector, universities, student dormitories, science institutions, social care institutions, centres for social affairs, as well as state administrative sector – Ministry of Economy, Ministry of Education and Science, Ministry of Environment and Physical Planning and Ministry of Transport and Communications). In addition, the specific consumption given in the same document is used (average 214 kWh/m²). This measure considers reconstruction including windows replacement of existing public buildings under jurisdiction of the central government. The measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the reconstructions into operation.

Table A- 55: Retrofitting of existing local self-government buildings

Mitigation action: Retrofitting of existing local self-government buildings

Main objective: Retrofitting of existing public buildings with aim to meet the objectives of the EE Directive and the Energy Efficiency Law

Description: Local self-government should be encouraged by the central government renovation strategy, so they can put special attention on buildings under their competence. For the calculations, the heated area of building stock from the National Program for EE in public buildings (Draft version) is considered (including primary and secondary schools, kindergartens, pupils' dormitories, municipalities and the City of Skopje buildings). In addition, the specific consumption given in the same document is used (average 214 kWh/m²). This measure considers reconstruction including windows replacement of existing public buildings under jurisdiction of the local self-government. The measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the reconstruction into operation

Government owned buildings may avoid the owner-tenant challenge lined out above, but not always. Different government departments may be responsible for investing in respectively operating buildings, which in many countries also hold back EE investments in the public sector. In the same manner as above, this is a barrier, not a risk. Aligning the cash-flows is a different kind of intervention that may be a precondition for making investments flow.

Assuming that cash-flows are aligned, these are the typical investment target of ESCOs the world over and would be a prime target for 3rd party investment in energy efficiency in North Macedonia. It may well be argued that it is also the most obvious intervention to underpin the establishment of an ESCO

sector in North Macedonia. Investment opportunities are multiple, of sufficient scale, comparable and thus good for establishing track records and best practice, all of which helps de-risking the EE/ESCO market. Thus, instead of spreading EE investments on all types of buildings, it may be beneficial to make a concentrated effort to build up capacity and experience and then expand from there.

The main de-risking tool again would be flexible contracting that reflects the lack of experience with behavioural effects of EE investments in North Macedonia. If these model contracts emerge from the work initiated under the EE Law, it will add further security to the sector. As for the proposed issuance of usage permits, see above under A-53.

Table A- 56: Retrofitting of existing commercial buildings

Mitigation action: Retrofitting of existing commercial buildings

Main objective: Retrofitting of existing commercial buildings with aim to meet the objectives of the EE Directive and the Energy Efficiency Law

Description: There is lack of data for the commercial building stock, but according to third NEEAP the commercial building area is estimated to nearly 8 million m². This measure considers reconstructions of existing commercial buildings including windows replacement initiated by the owners and/or supported by commercial banks and funds. The measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the reconstructions into operation.

Large commercial buildings may well face the same challenges as housing, in the sense that the building owners would not benefit from commercial tenants' savings, i.e. the traditional split incentive. In Skopje, for buildings heated by district energy, models similar to the one proposed above in collaboration with the heating company may be considered. For individually heated commercial buildings, it is likely that the owner is responsible for, and thus also charges for, the heat supply, and thus has a self-interest in reducing energy consumption. In either case, such larger scale renovation projects are a natural target for 3rd party investment in energy efficiency and as in the case above the main de-risking tool for such projects would be flexible contract duration to reflect the risks of entering a new market.

ESCOs engaging in EPCs with the private sector would benefit from financing through the EE Fund with affiliated commercial risk cover, particularly in a market start-up where clients are not used to the contracting model.

Table A- 57: Construction of new buildings

Mitigation action: Construction of new buildings

Main objective: Construction of new buildings that will meet the minimum criteria set in the Rulebook of energy performance in buildings

Description: An energy efficient building reduces maintenance and utility costs, but, in many cases, improves durability, lessens noise, increases comfort and creates a healthy and safe indoor environment. A further goal of energy efficient construction is to limit damage to the ecosystem and reduce the use of natural resources like energy, land, water, and raw materials. This measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the building into operation

Table A- 58: Construction of passive buildings

Mitigation action: Construction of passive buildings

Main objective: After 31.12.2020 all new building should be nearly zero-energy buildings

Description: The measure considers construction of new passive residential buildings in compliance with the EU Directive 2010/31/EU. This measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the building into operation

In the same way as setting standards for appliances, setting standards for new construction is relatively risk free, apart from the risk affiliated with the local construction industry potentially being unable to comply with the standard for lack of skills. In that regard, political de-risking should be provided in the form of training, including vocational training, as well as a dialogue with the local industry to ensure that the introduction of standards are transparent over the long term. Denmark, probably having the toughest building standard in the World in terms of energy efficiency, has achieved this through a system of 5-year standards, where the next standard has been known at least 5 years in advance. Standards are developed through intensive dialogue with (mostly) the national construction industry.

Transparency in this case is the best political de-risking strategy, the regulator remaining open to dialogue, but at the same time firm in objectives.

Table A- 59: Phasing out of incandescent lights

Mitigation action: Phasing out of incandescent lights

Main objective: Improve the efficiency of lighting following the EU policies.

Description: Governments around the world have passed measures to phase out incandescent light bulbs for general lighting in favour of more energy-efficient lighting alternatives. The goal is to improve energy efficiency, rather than forbid the use of incandescent technology. This measure includes replacing conventional incandescent light bulbs with halogen ones (at the beginning) and later with compact fluorescent (CFL) and LED.

Replacing incandescent light bulbs has been ongoing in the EU for almost two decades. Except for special purposes, they are no longer allowed. Production and import was banned within the EU with effect from February 2016. Thus, North Macedonia may well adopt a ban immediately instead of gradually. The proposal to move towards halogen is probably outdated. Not only are halogen bulbs almost as inefficient as incandescent bulbs, they are also in many cases as expensive as LED or even costlier. Also, the diversity of LED alternatives are an order of magnitude larger than halogen options and the technology keeps evolving, whereas halogen does not. This said, with a ban on incandescent bulbs, there is no reason to screen out halogen. LEDs, and to a lesser extent CFLs, will compete favourably and the market is likely to ensure uptake. (NB. North Macedonia's Energy and Climate Plan as opposed to the enhanced NDC, on this initiative, does not mention halogen. It does mention that a ban on sales of incandescent bulbs may be introduced by 2023).

There are no risks identified in this regard except possibly (limited) public dissatisfaction.

Table A- 60: Improvement of the street lighting in the municipalities

Mitigation action: Improvement of the street lighting in the municipalities

Main objective: Reduce the costs and increase the quality of street lighting.

Description: The cost of street lighting, including electricity and maintenance, can have a huge impact on the budget of the municipalities. In addition, having in mind that a lot of manufactories work on daily bases on the improvement of the light bulbs, new opportunities are being opened for the municipalities. The inefficient light bulbs should be replaced, purchasing new ones that comply with the criteria of belonging to the highest EE class possible (CFL and LED lamps).

Following the launch of the new EE Law, Makedonska Kamenica and Chesinovo Obleshevo were the first two municipalities in North Macedonia to implement Energy Savings Performance Contracts with an ESCO, in this case Makedonski Telekom, for the development of energy efficient street lighting. The contract period is around six years, during which the ESCO company undertakes the responsibility of proper installation and maintenance of the equipment. The EBRD helped facilitate this through Regional Energy Efficiency Programme (REEP), funded by the EU and supported by the Energy

Community. The contract period is around six years, during which the ESCO company undertakes the responsibility of proper installation and maintenance of the equipment.

This is a standard ESCO target and the fact that street lighting is the first to adopt the ESCO model after the introduction of the EE Law signals a positive interest among municipalities. However, municipalities are not always creditworthy partners for ESCO contracts. The EE Fund may provide liquidity risk insurance as part of its financing offer to ESCOs, in which case an EPC may move forward. A particular window within the EE Fund might be considered, compelling municipalities with EPCs financed through the EE Fund to pay into the guarantee window as a sort of 'solidarity mechanism' to help the EE Fund replenish payouts to municipalities that do not honour their EPCs.

Another option in that regard is to operate the billing through EVN or other distributors as a de-risking methodology preventing ESCO service suppliers from the risk of non-payment of municipalities. This model will not increase the current non-payment risk faced by EVN.

Not all municipalities are sufficiently large to support a street lighting EPC by themselves, which have led some to suggest aggregating several smaller municipalities into one bundle of small street lighting projects. This is more facilitative than de-risking and in terms of risk it may be considered, depending on the observer, either a de-risking by numbers or putting the entire bundle at risk by having a few risky eggs in the basket. Solidarity mechanisms, a kind of musketeer oaths, in such bundles may be helpful, but may also be difficult to agree. Therefore, it is a potential topic for the EE Fund to consider as part of its financial offer.

With such de-risking in place, street lighting is a straightforward first for ESCOs and thus a way to build up experience in the sector in the short term.

Table A- 61: “Green procurements”

Mitigation action: “Green procurements”

Main objective: Application of energy efficiency criteria (“greening”) in public procurement procedures
Description: According to Article 6 from the EE Directive, central governments can purchase only products, services and buildings with high energy-efficiency performance. Intensified activities should take place to ensure legal and technical knowledge and skills of public sector entities for inclusion and evaluation of requirements for energy efficiency in public procurement procedures by applying the criteria of most economically advantageous tender.

Traditionally, green procurement is to partly replace economic bid evaluation criteria with 'green' criteria. In some cases, particularly for energy consuming products, it is oftentimes sufficient to consider lifetime costs rather than purchase costs, incorporating the cost of energy consumption over the lifetime of the product into the total cost of the item.

In this way, public entities will be 'frontloading' the cost of ownership, but it is a temporary hurdle until the majority of such equipment has been replaced with energy efficient alternatives with lower operational costs.

Risks in this regard are comparable to those mentioned regarding labelling of electric appliances (A-50), i.e. potentially disadvantaging local suppliers.

C. ENERGY -- MANUFACTURING INDUSTRIES AND CONSTRUCTION

The industry does not feature prominently in the enhanced NDC and are mostly considered energy demand side options. However, North Macedonia's industrial sectors make up 22% in the final energy

consumption, 44% of which is accounted for by the Iron and Steel Industry, which again accounts for 51% of all industrial sector emissions in 2016. Principal fuels used in the Iron and Steel sector are coking coal, other bituminous coal, lignite, liquefied petroleum gases, residual fuel oil, natural gas and wood/wood waste. The coal-based fuels are carbon-tense and so there is scope to reduce these emissions by increasing the share of co-firing in furnaces with biomass and high-energy content Refuse Derived Fuels (RDF). Both Iron & Steel and the cement industry are excluded from the enhanced NDC. They are, however, included here as 'additional options'.

In the subcategory Manufacturing industries and construction three measures are proposed.

Table A- 63: Energy management in manufacturing industries

Mitigation action: Energy management in manufacturing industries

Main objective: Efficient management of manufacturing processes in the industry aiming to increase production using the same energy consumption.

Description: This measure considers the implementation of obligatory energy audits of large companies and implementation of ISO 50001 standard, as well as advanced measurement and introduction of new IT technologies. This will enable prevention of defects, better process control and quicker response times in manufacturing using advanced data analysis and predictive technologies.

Mandatory energy audits is a good starting point for the promotion of energy efficiency in industry. Disclosure is the first step to realize the potential profits from energy efficiency investments. It has a natural linkage to the establishment of an ESCO industry, although it is important that the auditor and the ESCO is not one and the same. Protocols are established, e.g. the International Performance Measurement & Verification Protocol (IPMVP) celebrating its 25 years in existence in 2021 and promoted by the Efficiency Valuation Organization (EVO). Industry is known to show reluctance towards embarking on larger scale energy efficiency projects fearing interruption of production. Therefore, not only the profits from energy saving are important. Even more important is the risk of implementation - technical risks with potentially significant economic impact on business. Energy efficiency in industry is therefore more challenging than in the built environment.

In most countries, there is a well-developed service sector that provides professional energy audits for industry and offers different types of contracts for exploiting the potentials. These skills are not well-developed in North Macedonia, but may be developed as part of the establishment of the EE Fund. It would be a natural expansion of an initiative to nurture the development of a professional ESCO sector.

As the initiative does not move further than mandatory energy audits, there are no risks involved, and the industry is left to decide for itself if it wishes to exploit some of the efficiency potentials revealed from auditing.

Table A- 64: Introduction of efficient electric motors

Mitigation action: Introduction of efficient electric motors

Main objective: Increase the competitiveness of the industrial products through improvement of the efficiency in the production process and reducing the resources.

Description: Electric motors are responsible for a high share of the total electricity consumption in industries. This measure considers replacement of the obsolete machines currently in use, with new more efficient motors.

A way to overcome industrial reluctance towards larger scale EE projects is to focus on single technologies for replacement. However, single technology programmes commonly require financial incentives, which are unnecessary expenses for technologies that are generally able to pay for themselves through energy savings (oftentimes in 12-24 months). As a rule of thumb, it should only in exceptional cases be necessary to offer grant support for energy efficiency (although many countries still do so). Instead, single technology projects may be offered through energy performance contracts,

e.g. a replacement of all pumps over a given period of time at an industrial plant. Technology-specific ESCOs may undertake such programmes.

As mentioned above, industry is sensitive to production stops, and ESCOs requiring temporary stops to sections of production for the replacement of components may be faced with demands for reparation if the installation fails. The ESCO industry needs access to risk cover to embark on such projects. It is possible, that the EE Fund could consider such risk cover as part of its financial offer. Technology suppliers will rarely assume responsibility beyond the functioning of their own product and will not extend any compensation to production losses.

The 'no regrets' approach is to set minimum EE standards for industrial appliances and machinery that includes motors. In that way, outdated technology will be replaced with efficient alternatives when it breaks down. Acceleration beyond that may require specific de-risking of potential production losses as mentioned above.

Table A- 65: Introduction of more advanced technologies

Mitigation action: Introduction of more advanced technologies

Main objective: Introduction of more advanced technologies in the industrial processes that will also enable use of more environmental friendly fuels.

Description: Advanced industrial technologies present major opportunities for further reduction of the energy consumption and potentially lower costs as well as environmental benefits. In addition, they can help various industries to progress at a much faster rate

This initiative requires specificity in order to consider de-risking, although it may be considered at par with the single technology focus of A-64, only for unidentified technologies.

There are specific EE opportunities in steel production and cement manufacture in North Macedonia which could (and should) fall into this category. These are discussed below, although they are not specifically targeted by this initiative.

1.1.3 Other possible initiatives under Industry

There are two significant omissions in the enhanced NDC regarding initiatives in the industrial sector. The steel industry commonly represents a significant emitter where it is present. Equally, the cement industry is a large emitter of GHGs. Both industries are relevant candidates for emissions reduction initiatives, particularly in waste heat recovery and fuel switch.

Iron & Steel

There is a risk to the steel facilities in being encompassed by the EU emissions regulations and the EU ETS as well as standards for a per-ton emissions factor that North Macedonian output is likely to exceed upon Accession. Therefore, initiatives in industry should be considered. It is not known if waste heat recovery technology has already been implemented in the steel industry. Generally, the description in the enhanced NDC and the 3rd BUR is very opaque with theoretical rather than practical observations and no improvement over the 2nd BUR indicating a reluctance to engage.

However, under the assumption that waste heat recovery (not to mention more advanced emissions reduction initiatives) have not been implemented, this represents a commonly very profitable energy efficiency measure based on mature technology. Even without a price on carbon, an average IRR of 9.8% has been recorded globally (based on a count of 47 projects for which data is available - see www.cdmpipeline.org). The steel sector in North Macedonia is responsible for about 377 tCO₂e of

emissions annually with no clear avenue for its decrease despite that it is likely to be encompassed by the EU ETS and hence eventually a target for emissions reduction regardless of its omission in the updated NDC. A simple assessments of the waste heat recovery²⁷ potential (but not knowing the specific conditions at the production sites in North Macedonia), would estimate the reduction potential to be at least 25% or about 90 tCO₂e/year. This is based on estimates recently published for the EU²⁸, where German iron & steel is the de facto benchmark due to its significant share of the overall sector emissions. It is conceivable that the current German standard technology is more efficient than the one currently in use in North Macedonia - in which case the reduction potential would be even higher.

If implemented with third party investors (ESCOs), such projects are based on complex contracts as there are de-risking requirements on both sides. These encompass construction as well as operation. Delays in construction has immediate economic consequences. The construction company/technology supplier is commonly able to produce such risk cover as it is central to its business. The actual performance of the technology during operation is another. Oftentimes, the competition among ESCO contractors is on the duration of the contract. Therefore, flexibility on contract length is not a (likely) de-risking mechanism for the ESCO.

These are options, which other countries have pursued through simple regulation rather than de-risking. However, such projects come with the risk of production interruption as described above under A-63. A-63 only considers the audit. The actual implementation may well require de-risking. Some of the risks are commonly covered by reputable technology suppliers. The sector itself is aware of its carbon footprint and countries and industries are seeking low carbon solutions, see e.g. <https://www.sintef.no/en/projects/2015/sfi-metal-production/> (Norway). Also in this context, ESCOs have proven useful, especially in China where hundreds of waste-heat recovery projects have been implemented in the steel industry over the past 20 years, a significant part of which were registered as CDM projects (see cdmpipeline.org).

It has not been possible to map the industry. Allegedly, Makstil AD, the complex of the former Ironworks, operates over 60 entities (many of which, according to the SEI, do not have environmental reports, see [maksil article](#)). Technical feasibility aside, technical risks can be reduced by addressing a single or two of such entities (if they are comparable) as a starting point.

Cement

The cement industry in other countries is commonly a target for the off-take of RDF - refuse derived fuels - and may similarly serve this function in North Macedonia. It is currently not known, if this is already happening. And also the cement sector is relevant for waste heat recovery, although this will depend on specific assessment.

According to the national waste management plan, opportunities exist to make better use of residual municipal waste. The production of Refuse Derived Fuel (RDF) and Solid Recovered Fuel (SRF) for energy recovery will be explored including the use of existing co-incineration capacity. There are two cement kilns within 20-30 miles of Skopje. This approach would require development of treatment facilities to prepare the waste but not investment in dedicated EfW infrastructure. Regional Plans for the areas with access to co-incineration capacity should explore this possibility.

²⁷ For waste heat recovery technologies, see e.g. <https://www.energy.gov/sites/prod/files/2014/05/f15/35876.pdf>

²⁸ see 'Estimating the waste heat recovery in the European Union Industry', <https://link.springer.com/article/10.1007/s40974-019-00132-7>

1.2 Energy - Transport

Although the transport sector in this context is considered a part of the energy sector, it constitutes a separate area of interventions the background for which is briefly lined out below before de-risking considerations for proposed intervention continues.

North Macedonia's Transport Sector Strategy (2018-30) is driven by the ambition to integrate with the EU and therefore includes moving to EU Guidelines and Directives/ Regulations by including requirements related to safety and security, the environment, and North Macedonia's international commitments. The strategy includes full integration of the Macedonian transport network in the European TEN-T, introducing green mobility and logistic with a focus on environmental with a target of reduction in GHG emissions from the sector by 5% in 2025 and 7% in 2030. Low carbon transport can also help Macedonia address the air quality issue. The modal shift strategy from road to rail for freight transport helps increase reliability besides reducing emissions. The infrastructural links between various modes of transport will be developed and integrated using Intelligent Transport System (ITS) technologies. Necessary regulatory and institutional framework will be put in place.

Macedonia First NDC- 2015 identified three mitigation policies and measures in the transport sector:

- Increased use of railway,
- Renewal of the vehicle fleet,
- Increased use of bicycles, walking and introduction of a parking policy.

All three were negative cost options as per the information given in the BUR. In addition, 5% biofuel was also included in the energy supply for use in transport sector. For the Higher Level of Ambition scenario, two additional mitigation policies and measures were included:

- Extension of the railway to Bulgaria (highest positive cost)
- Electrification of transport

In addition, biofuel supply to transport was increased to 10% in this scenario. However, the enhanced NDC does not include this initiative.

The contribution to reductions from individual sectors or measures was not indicated in the first NDC. In comparison, Macedonia's enhanced NDC includes seven additional mitigation measures in the transport sector the rationale for which is well documented in supporting documents. It is also evident that transport sector emissions are expected to increase after 2030 even in the WAM mitigation scenario. However, their share in total emissions from energy use declines to 18% from a high of 21% in 2016.

The options included in the enhanced NDC have been analysed with respect to de-risking below.

Table A- 66: Increased use of the railway

Mitigation action: Increased use of the railway

Main objective: Improve the energy efficiency in the transport sector using cheap and efficient railway transport.

Description: Although the rail transport is cheap, official statistical data show that in the last three years there is a downward trend. Using this mode of transport as one of the most efficient can also improve the competitiveness of the companies. Therefore, at least several listed measures should be implemented, aiming to return the utilization level of this transport as of three years ago, and further increase it. The measure includes: implement raising awareness campaigns, invest in stations

(rehabilitation of existing ones) and improve the “access to the stations”, increase the network security and expand the network coverage

The decreasing use of the railway system is a behavioural challenge that most countries have faced, particularly as car ownership and its affiliated convenience in many respects is becoming commonplace. In that regard, the initiative is closely linked to A-67. Improving the service of the railway is considered risk free and not a target for any de-risking initiative, neither financially nor politically, except for the risk that the intended investments, presumably by the national railways, do not have the intended effect of bringing passengers back. It will need to be ensured that the train service is actually able to meet commuters' needs at a satisfactory level. However, improving the service of the system and upgrading stations can also be considered 'no regrets' investment as it tends to be in the category of maintenance.

Expanding the network, however, is beyond maintenance and may face investment risks depending on the financing model, which could include even private investors. However, assuming that such investment would be addressed by state owned entities and the financing equally raised as government funds, the financial risks may be considered inter-departmental and hence not a target for a de-risking roadmap with a prime focus on private investors. Also, unless serving highly populated areas, the emissions affiliated with rail construction may not be offset by its displacement of private cars.

Table A- 67: Renewing of the national car fleet

Mitigation action: Renewing of the national car fleet

Main objective: Use of more advanced technologies in order to slow down the growing energy consumption in the transport sector, which is complex and with limited capabilities of energy use reduction

Description: The measures recommended in the Study on the transport sector analysis of policies and measures should be implemented: Reduction of VAT from 18% to 5% for hybrid and electric vehicles; Direct subsidizing of hybrid vehicles, Excise duties of diesel fuel and petrol need to be gradually equalled. Obligations of public institutions to purchase vehicles with low CO₂ emissions (up to 90 gCO₂/km by 2020 and 50 gCO₂/km by 2025). The quantified effects of this measure should also be analytically modelled and mitigation costs assessed

Transport, and particularly person transport and private ownership of cars, is a contentious issue in any country. Constraining the electorate's access to mobility carries significant political risk. At the same time, North Macedonia's car pool is among the oldest in Europe and slowly getting older. This is linked to the expansion of the number of cars in general, reaching parts of the population that formerly had no access. Although cleaning up the car pool would have positive impacts on emissions, it is unlikely to be a feasible short term option. EU membership may help provide a backdrop for increased enforcement of vehicle permits and screen the worst vehicles off the roads until a general increase in wealth will inevitably lead to purchase of less polluting cars.

That said, reducing the VAT on hybrid and electric cars from 18 to 5% is a risk-free initiative except for the actual emissions reduction effect, which is difficult to assess. The adequacy of the measures will be known only during implementation and may not be sufficient for the target consumers to take desired action. An increase in costs of the alternative through higher excise duties on diesel and petrol is likely to help, but comes with political risks. A harmonization with EU levels²⁹ is inevitable, however. Even if taxes on transport fuels have not been widely used in Europe as an environmental policy measure to directly influence transport demand levels, the excise rates in North Macedonia are generally lower

²⁹ <https://www.eea.europa.eu/data-and-maps/indicators/fuel-prices-and-taxes>. EU minimum levels for road fuel taxes are set out in Council Directive 2003/96/EC on the taxation of energy products.

than the minimum rates prescribed by the Energy Taxation Directive of the EU³⁰. The difference is particularly evident for diesel fuel, which provides most of the excise duty revenues. The national rate on unleaded petrol is almost equal to the EU minimum, while the national rate on diesel is approximately 25% lower than the EU minimum. (Interestingly, the national rate on diesel for heating (red diesel) is almost five times higher than the EU minimum rate, possibly indicating that there is a scope for increasing the duties without too much political risk - or reducing the excise on diesel for heating as a partial compensation for increasing it on diesel for transport).

Table 3. Car trading

2018	Import	main countries	Export
small <1500 ccm	\$16.1M	Romania (\$3.18M), Turkey (\$2.55M), Bulgaria (\$1.88M), Slovenia (\$1.65M), Germany (\$1.59M)	\$811k
medium 1500<x<2500	\$106M	Germany (\$22.9M), Hungary (\$20.8M), Czechia (\$14.2M), France (\$12.2M), Bulgaria (\$10.6M)	\$2.35M
large >2500 ccm	\$33.1M	Hungary (\$15.4M), Germany (\$10.1M), Bulgaria (\$1.23M), Switzerland (\$1.17M), Slovakia (\$1.13M)	\$39.8k
https://oec.world/en/profile/bilateral-product/small-diesel-engine-cars/reporter/mkd			

There are indications, however, that North Macedonia's challenges in the transport sector are of a different nature. North Macedonia runs a thriving market for used cars and particularly diesel engines. A snapshot of the 2018 market is provided in table 3. The average age of the car pool is approaching 18 years. Thus, even without a technology shift towards electric and hybrid cars there are significant emissions reduction potentials just by replacing the oldest parts of the current stock of cars with newer vehicles. In 2018, the average tariff for North Macedonia in small diesel engine cars was 4.27%.

It is doubtful, if the increase of fuel taxes and the reduction of VAT on low emission vehicles can compete with this thriving industry, but in terms of investment de-risking there is not much the Government can do. Rather, in fact, *increasing* the risk of ownership is probably more relevant. Enforcement in the sector of the regulations surrounding car ownership is reported to be haphazard, and the 2020 EU evaluation of the status in the sector establishes that North Macedonia is only 'moderately prepared in the area of transport' saying further that 'limited progress was made in the reporting period, but only in relation to connectivity... and more efforts are needed to strengthen the administrative and operational capacity for all modes of transport.' All the recommendations by the European commission from 2019 remains valid, and North Macedonia should particularly 'strengthen the operational and administrative capacity of the inspection bodies and develop enforcement capacity to reduce fatalities along road and rail infrastructure.'

Finally, obligating public institutions, possibly including municipalities, to buy low emissions vehicles may serve the purpose but it would cover only new vehicles. For the existing vehicle stock, other measures may be needed. An age may have to be decided beyond which vehicles are taken off the road and scrapped. Requiring public institutions to purchase low emission vehicles equally ranges among initiatives that mostly carries political risks and hence is not directly targeted by a de-risking roadmap.

Table A- 68: Renewing of other national road fleet (light duty and heavy goods vehicles and buses)
 Mitigation action: Renewing of other national road fleet (light duty and heavy goods vehicles and buses)
 Main objective: Reduction of local air pollution (SO₂, NO_x, PM_{2.5} etc.)

³⁰ see the World Bank's policy note of July 2020: 'Environmental Tax Reform in North Macedonia - Improving environmental and social outcomes from fuel use'.

Description: This measure anticipates introduction of a regulation that will enable renewal of the vehicle fleet of light duty and heavy goods vehicles and buses.

The gradual change of the national fleet of light duty and heavy goods vehicles and buses through regulation carries, like the above, probably a political risk. In terms of investment, however it may also pose a risk to the affected business, if a compulsory decommissioning of old vehicles is introduced. As there are no indication that this may be the plan, and only the introduction of a requirement for Euro 6 compliance of vehicles that are imported and/or sold in the North Macedonian is considered, there are no identified investment risks related to this initiative. All the above considerations on excise duty on fuels equally applies here.

A main strategy might be to limit the access of commercial vehicles into Skopje during daytime if they do not conform to Euronorm 6. While such models inconvenience owners of non-compliant vehicles they are not illegalized. It is a model that is seen in use in many cities globally.

Table A- 69: Advanced mobility

Mitigation action: Advanced mobility

Main objective: Reduction of the local air pollution (SO₂, NO_x, PM2.5 etc.)

Description: The measure includes conducting campaigns/providing subsidies and systems for use of new or rented bicycles, electric scooters, promoting walking, and introduction of parking policies that would reduce the use of cars in the city area. People, especially in smaller towns where a lot of them use cars for short distances, would increase the use of bicycles/electric scooters or walking.

The "Advanced mobility" initiative is a mix of behavioural encouragement and support of small EVs. There is little investment required, unless the introduction of small EVs would follow the pattern of many other cities in Europe where private operators of fleets of electric scooters have met increasing opposition due mainly to safety issues and disorderly parking, but also questioning the actual emissions reduction effect because of 'leakage' - many EV rides replace walking or bicycling, and few actually replace driving. Further, if the electricity is based on fossil fuel generation, the drive is not clean anyway. For the above reasons, their use have been restricted many places. With this track record in mind, investors in the provision of such EV services - if this is the implementation modality considered - should be assured of an unchanging regulatory environment, at least for an agreed term, a pilot phase, which allows the investor to build up the business. Such contracts would need to include clauses of full compensation to the investor, should the authority granting the concession violate this principle. If this entity is Skopje municipality, it is likely that the concessionaire will be able to insure the contract in the market. If it is any other municipality in North Macedonia, insuring such a contract may be challenging. However, given that this is a niche and only a small part of this initiative - and that this implementation modality is not mentioned specifically - an initial test in Skopje should suffice and further de-risking is thus not considered necessary, even if the use of EVs in small towns would be desirable.

The supplementary measures of increased parking fee, reduce the number of parking lots, widen cycle tracks, increasing safety and preference for cyclist on road, in some cases discourage the use of cars in congested areas, but it also fuels a 'war' between groups of road users. Hence this is a balancing act that takes years to gradually achieve the desired results without increasing political risks. Increased use of bicycles by public representatives including ministers and officials can have a strong demonstrative impact.

Table A- 70: Construction of the railway to the Republic of Bulgaria

Mitigation action: Construction of the railway to the Republic of Bulgaria

Main objective: Connecting North Macedonia with Bulgaria and extending the export to external markets, not just in the neighbouring countries but in the Southeast Europe and Turkey region, using the railway transport.

Description: Construction of the railway to the Republic of Bulgaria

The extension of the railway to Bulgaria is a long standing wish of both nations. The aim is to complete the railway line from Skopje to the Bulgarian border by 2027. When Skopje and Sofia are connected, this railway line will be part of the trans-European corridor number 8, which should link Bulgaria, Macedonia and Albania. However, it may also link to the prospective Chinese rail project from Budapest through Belgrade and Skopje to Chinese owned Thessaloniki port, contemplated as part of Chinas Belt and Road initiative. The link has attracted EU funding as part of a package of transport investment agreed at a summit in Trieste in July 2017, establishing a transport community between the EU and the Western Balkans. The EU document states that seven new transport projects in the Balkans were agreed at the summit, with an overall value of around €500 million, to be co-funded by the EU. It put the value of the Skopje-Sofia railway at €152 million, by far the biggest of the seven, with the EU grant providing almost half, or €70 million³¹.

Under the assumption that this EU grant remains valid, this is in itself a significant de-risking factor, reducing the requirement for sovereign guarantee support. The link is implemented by Macedonian Public Enterprise for Railway Infrastructure (PERI), a state-owned company established in 2007, to which the Macedonian Government will be on-lending. The link is likely to be financed with EBRD funding and a specific de-risking strategy by North Macedonia, if required at all, is likely to be part of a financing agreement with the financier. The exact status of the financing is not clear, but according to EBRDs website³² a grant agreement for a further €68.6 million of co-financing from the European Union through the Western Balkans Investment Framework (WBIF) was signed in December 2018.

Overall, this link does not seem in need of any particular de-risking.

Table A- 71: Electrification of the transport

Mitigation action: Electrification of the transport

Main objective: Transition from society based on fossil fuels to low carbon society, where the renewable energy and electrification of the transport will play the most important role

Description: At least the following measures recommended in the “Study on the transport sector, analysis of policies and measures” should be implemented:

- ▶ Based the methodologies for calculation of environmental taxes on CO₂
- ▶ Direct subsidizing of electric vehicles, 5000 EUR in the period 2020-2023
- ▶ Reserve green parking in all public parking lots
- ▶ Obligation to place fast chargers at all gas stations on motorways (at every 100 km by 2020)

Of the above listed four elements, only the latter is relevant for investment, assuming that the obligation will be imposed on service stations along the motorways. However, the road network of North Macedonia has a current total length of 14,182 km consisting of 242 km of motorways, 911 km of national roads, 3,771 km of regional roads and 9,258 of local roads, which diminishes the target to less than ten chargers, which like the above EV scooters is a niche that probably does not warrant a specific de-risking initiative. The investment in a fast charger is likely one that can be overcome by a gas station on its own account.

1.2.1 Other options within Transport

The share of biofuels in transport is taken as 10% by 2030 for which biofuel market will be developed and an action plan has been made. Action has also been initiated for development of an appropriate law on biofuels. Macedonia renewable energy target, including its use in

³¹ <https://www.euractiv.com/section/enlargement/news/eu-pledges-funds-for-new-balkan-railway-transport-projects/>

³² <https://www.ebrd.com/news/2018/ebrd-partners-with-eu-for-macedonian-railway-corridor-viii.html>

transport sector is driven by EU regulations. The 2018/2001 EU Directive on the promotion of the use of energy from renewable sources requires that the share of renewable energy within the final consumption of energy in the transport sector is at least 14 % by 2030. According to the briefing paper (by MOEP&PP, and UNDP; Integrating Climate Change into Transport Sector- Briefing Paper), 8% renewable share in transport is expected to be added through electric vehicles, taking the total share to 18%. RES directive however place certain restriction on share of biofuels, if produced from food and feed-crops to 7% maximum. It also places certain restrictions that discourages installation of this type of new plants by disallowing emissions savings to meet the EU obligations. Additional risks in this case include non-availability of finance from EU for plants that do not meet their sustainability criteria as defined in the directive. Even in the future, changes may be required in the plan for biofuel development due to further tightening of the directive. These issues, however, pertain to supply side of the energy and need to be included in the energy supply de-risking framework.

1.3 AFOLU

The emission of greenhouse gases from agricultural production in Macedonia can be attributed mainly to i) livestock production - as a result of enteric fermentation and management of manure; and ii) crop production - as a result of fertilisation with mineral fertilisers, practices related to manure management, conversion from extensive to intensive crop production systems and inadequate/improper management of arable lands. However, as reported in the 3rd BUR and the enhanced NDC the main drivers of increasing GHG emissions in the AFOLU sector (as explained by the IPCC³³) are not noticed in the country, and the opposite is reflected in official data (3rd BUR and the enhanced NDC). Nonetheless, the currently observed situation can easily change as a result of new and evolving conditions, especially accession to the EU which may improve conditions for investments, also in the agricultural sector.

Forests and forest lands are the main CO₂ sinks in Macedonia, except during years when forest fires (resulting in burned areas) are significantly above the annual average. The total GHG sinks in this sector was estimated at 1,608.31 Gg CO₂eq for 2015 and 2,120.65 Gg CO₂eq in 2016. Estimates from 2017 put the total area of forest, forest land and barren land at 1,122,258 ha - of which 1,001,489 ha are forest, 109,126 ha forest land and 11,643 barren land. During the period 2009 to 2017 approximately 43,252 ha of other woodland were converted to forest, a process that is considered important for the planning of climate change mitigation and adaptation measures. Forests are characterised by a high level of species diversity but low quality and levels of annual growth. More than 70% of national forests are coppice, with 90% being deciduous and dominated by Beech and various oak species. The total wood reserve is estimated at around 70 million m³.

Ownership of forest lands in Macedonia is divided into 90% state owned and 10% privately owned. Therefore, the state represents the biggest driver of change in national forestry practices, which can determine whether forests and forest lands are developed to capture more carbon, thus further offsetting emissions from other productive sectors of the economy. This reveals a fundamental set of political and regulatory risks and de-risking opportunities for investment in new technologies and/or management processes that can be almost entirely managed by the state. As such, clear targets and mandating of more sustainable and low-carbon measures are almost entirely within the gift of State agencies and actors.

³³ These include increased livestock numbers, increased area under agriculture, increased use of fertilizer, increased area under irrigation, increased human and animal populations etc.

Within AFOLU, the livestock sector represents the main sources of GHG with total emission of CO₂eq varying from 1,108.11 Gg in 1990, to only 792.68 Gg in 2014. Among ruminants, cattle are the main source of GHG emission, with the majority of methane emission produced from enteric fermentation, while manure management contribute with only 18% of the total CH₄ emissions.

The AFOLU sector is expected to contribute to achieving the targets of the enhanced NDC through a 29% reduction in emissions in the agricultural sector, together with a 95% removals increase in the land use and land use change, and forest (LULUCF) sector. This contribution from the AFOLU sector, similar to that of other sectors, has been strategically framed through specified policies and measures (PAMs)³⁴ to be implemented or enhanced. Eleven PAMs have been specified for the AFOLU sector.

Two key assumptions guide the implementation of the identified PAMs in the AFOLU sector. These are:

- i) The rate of conversion of the land for the period 2000-2016 will keep the same trend by 2040. The assessment of the values for the period 2013-2040 was prepared employing a simple extrapolation method.
- ii) In livestock, the current state of productivity and management method of the farms is maintained over the whole planning period.

As it pertains to the AFOLU sector, a de-risking of measures in support of the enhanced NDC will require a close analysis of the key elements of the 11 identified PAMs that will significantly affect their effectiveness in helping the sector to achieve its specific targets, as well as the reliability and applicability of the two main assumptions listed above (as well as that of other PAMs specific assumptions). The specification of these PAMs takes into consideration the current conditions in the country, as well as some of the changes expected to occur over the implementation period, stemming from logical extrapolations based on global, regional and national trends in development and investments. An evaluation of the sub-sectoral PAMs for the AFOLU sector can guide the formulations of recommendations for improving their adequacy for address GHG emissions reduction in the overall sector, as well as assessing whether other immediately applicable options exist to further contribute to the reduction in GHG emissions in the country.

The AFOLU sector comprises three subsectors, which here are combined under one heading, although the enhanced NDC distinguishes between livestock, agriculture and forestry.

Livestock Subsector

In the case of the livestock sector, 3 of the 4 mitigation measures target improving manure management practices to reduce emissions of N₂O in the production of dairy cows, and NO₂ in swine farms. Currently, there is little to no enforced regulation for the treatment of manure on livestock farms in Macedonia. Although laws exist, especially for large farms with intensive production systems, the lack of enforcement results in farmers opting for the cheapest methods for manure management, that do not consider the impact on GHG emissions, nor other environmental benefits.

The fourth mitigation measure in the livestock sub-sector targets a reduction in emissions of CH₄ from enteric fermentation in dairy cows, through nutrition management. This measure can be relatively cost effective as it mostly requires building farmers' awareness level of the impacts of carefully managing total mix rations (TMR) for animal on the level of methane emitted as a by-product.

Three out of the four mitigation measures identified for the livestock subsector target larger farms with intensive production systems. However, these farms currently represent less than 10% of dairy farms

³⁴ A total of 63 PAMs are identified in the enhanced NDC across the key economic sectors of i) energy, ii) Industry processes and product use, iii) AFOLU and iv) waste.

in the country, leaving a very large proportion of livestock farms unattended. Although the proportion of large farms with more intensive production systems is expected to steadily increase, there is still a fairly large amount of untapped potential for implementing additional mitigation measures under the current and immediate future condition in the country. This is especially so in the case of waste (manure) management from smaller farms. A recently conducted livestock survey in North Macedonia concludes that farms fail to take special care for proper manure treatment. Especially in the case of small farms, manure management follows very traditional methods that do not consider the impacts on GHG emissions, nor the true beneficial value of manure.

Designing and promoting mitigation measures targeting all farmers (big and small, intensive and extensive production systems) for improving manure management (collecting, disposing and correct uses [both as fertilizers or as sources of biogas]), will realise greater mitigation benefits, as well as additional benefits to other economic sectors (e.g. energy generation).

Land Use and Agriculture Subsector

The mitigation measures proposed for the "land use and agriculture (crop production)" sub-sector are aimed at improving the management of sloping lands under cultivation (2 of the measures), improving the carbon sink potential of the land (2 of the measures) and reducing the emissions of CO₂ during irrigation for crop production (1 measure). Four of the five mitigation measures aim at improving or maintaining soil quality by employing practices that reduce soil erosion and the loss of organic matter, or directly adding organic matter to arable lands.

Converting lands not suitable for agriculture, due to steep gradients >15%, into carbon sinks in the form of grasslands has the dual effect of increasing carbon sequestration and reducing the loss of soil carbon due to soil erosion. The potential for carbon sequestration can be further enhanced by converting some of these lands to forests. Grasslands are however, important carbon sinks, as most of the carbon sequestered is stored underground and is not released if the lands are subjected to fires. This is important in the case of Macedonia, where forest fires can contribute significantly to emission levels.

The treatment of waste, in the form of plant biomass, from agricultural production is not addressed in the proposed mitigation measures. This is probably due to the scarcity of data on the treatment of this agricultural waste in the country. Including mitigation measures that address the proper treatment of this waste product may further enhance mitigation potential of the agricultural sector.

The use of renewable sources of energy in agricultural production is only addressed in the irrigation process. However, there are other avenues where the use of renewable energy can further increase the mitigation potential of the sector. These include the use of electric powered vehicles in mechanised systems and the use of methane (generated from livestock waste) powered small electric motors.

Forest and forestry

In the case of the forestry subsector, better management of forest fires and afforestation of barren lands are the proposed mitigation measures. Given the important contribution of these measures to increasing and maintaining the carbon sinks that are forests, these measures are significant to offsetting emissions from other productive sectors. Together with the afforestation of barren lands, the avenue of agroforestry could be explored as a means of simultaneously increasing carbon sequestration levels, while increasing the economic value of unused lands and providing employment opportunities. Agroforestry systems can also provide added ecological benefits for the surrounding ecosystems due to an increase in species diversity. In terms of industry investment to change practices in line with the enhanced NDC ambitions, the risks and de-risking options are within almost total control of the

Government. In short, this means political will, regulatory oversight and compliance checking are the key means by which Government agencies and actors can deliver change.

1.3.1 De-risking AFOLU initiatives

Table A- 72: Reduction of CH₄ emissions from enteric fermentation

Mitigation action: Reduction of CH₄ emissions from enteric fermentation in dairy cows by 3%

Main objective: Decrease level of CH₄ emission from enteric fermentation in highly productive dairy cows

Description: By modification of the feed composition and nutrition practice in dairy cows, the emission of CH₄ due to enteric fermentation can be reduced by 20%. It is foreseen that the number of dairy cows under intensive farming system will be increased from present 1% to 30% in 2040. Because of highly productive cows involved the CH₄ emission will also increase. But, with modification of feed content (adding carbohydrates, high quality forages and tannins) into TMR, the CH₄ emission will be decreased by 20%. The mitigation measure can be easily applied on dairy farms, by nutrition management. It is also cost effective; do not require additional subsidies or incentives. Practical training and demonstration for farmers will be sufficient

Fundamentally, as this initiative is focused only on achieving behavioural changes among farmers, there are no investment de-risking initiatives identified or required. Regulation may be required, however, to make available the desired feed types and feed suppliers and farmers alike will have to adapt. To what extent this may require changes in feed production in North Macedonia is not known, nor if there are specific risks affiliated.

Table A- 73: Reduction of N₂O emissions from manure management in dairy cows by 20%

Mitigation action: Reduction of N₂O emissions from manure management in dairy cows by 20%

Main objective: Decrease level of N₂O emission from manure management in highly productive dairy cows

Description: By modification of the manure management in dairy cows, the emission of N₂O can be reduced up to 20%. It is foreseen that the number of dairy cows under intensive farming system with more than 50 heads will be increased from present 1% to 30% in 2040. All those farms will need to apply improved manure management in order to reduce N loss, and NO_x emissions. Therefore, on farm manure management system needs to modify. The mitigation measure, consider on farm adaption on existing farms and moderate investments on newly established farms. It will require subsidies for adapting and incentives in farm design and construction.

Table A- 74: Reduction of N₂O emissions from manure management in swine farms

Mitigation action: Reduction of N₂O emissions from manure management in swine farms by 13%

Main objective: Decrease level of N₂O emission from manure management in highly productive swine farms

Description: By modification of the manure management in swine farms, the emission of N₂O can be reduced up to 50%. It is foreseen that number of fatteners and number of fatteners per sow will increase, while the total number of sows will remain stable over period. Number of swine farms with more than 1000 fatteners and/or 350 sows will also increase and they need to adapt improved manure management system, in order to reduce N loss. In 2040 is expected that 90% of fatteners will be produced on those farms, accounting for 75% of sow in the country. The mitigation measure, consider on farm adaption on existing farms and moderate investments on newly established farms. It will require subsidies for adapting and incentives in farm design and construction.

Table A- 75: Reduction of N₂O emissions from manure in dairy cows by 20% for farms below 50 Livestock Units

Mitigation action: Reduction of N₂O emissions from manure in dairy cows by 20% for farms below 50 Livestock Units

objective: Decrease level of N₂O emission from manure management in dairy cows on farm farms below 50 Livestock Units

Description: By modification of the manure management in dairy cows, the emission of N₂O can be reduced up to 30%. In discussion with farmers, the most common system is dry manure management, where manure together with bedding (mostly wheat or barley straw) are taken out of the barn daily or within week. The manure than is composting on pile near the farm. Farmers do not use any cover of manure nor tanks for collecting liquid drainage of the pile. Fermentation is usually mixed where in bottom parts is anaerobic, but on the surface, due to aeration it is aerobic. Manure is used as fertilizer mostly within 2-3 months (depending on storage capacity on the farm and field availability). Depending on manure fermentation the loss of N can be up to 60%. The N loss and reduction of the N₂O emissions can be reached by prolonging fermentation period up to 6 months and covering the pile. Hence the measure is to support farmers with less than 50 cows to provide proper manure storage places for longer period.

The three initiatives A-73, A-74 and A-75 all concern manure management, which is one of the most important emissions reduction options in the AFOLU sector. In principle, the approach to manure treatment is the same regardless of the size of farm or type of animal, but technically there are different options.

Manure management systems at larger dairy farms require investments that are not trivial. First and foremost investments are in covered storage tanks, but such tanks may be added smaller or larger power generation depending on amounts of methane generated from fermentation. Extracting the methane improves its value as fertilizer, hence increasing its potential to displace chemical fertilizers. A levy on chemical fertilizers may be introduced to finance a commercial risk guarantee for suppliers of manure tank systems.

It is possible to estimate³⁵ that approximately 25% of North Macedonia's 120,000 dairy cows are located at the 1% of the total of farms that have more than 50 heads per farm. This is about 300 farms - a number sufficiently large to justify a dedicated financing scheme including a de-risking model.

A cow produces about 20 m³ manure/year, which should remain in a dedicated tank for about 7 days for the generation of about 300 m³ of methane (it takes about 1500-1800 m³ to heat a family house for a year). A dairy farm with 100 cows thus needs a tank for 40 m³ manure, which is ideally suited for a container-based solution. A manure container of 45 m³ is about 15,000 € (the advantage of container based solutions is that containers come in different sizes so that also smaller farms down to about 20 cows can participate). It may be possible to establish one or more collection systems based on a number of containers and central biogas plant(s). Biogas-based energy production already exists in North Macedonia. Such an industrial scale manure treatment system with several stakeholders would ideally be organized as an SPV with dairy farms as main investors, but potentially also inviting a 3rd party investor dedicated to energy production.

For a 3rd party investor, de-risking requirements in such context will concern participation of the farms. Government regulation that requires manure treatment and methane emission control (closed storage) will be helpful, particularly if enforcement is ensured. Farm co-investment in an SPV would equally constitute a de-risking measure in that regard. Returning the de-gassed manure as fertilizer to the farms

³⁵ based on Blagica Sekovska, Marina Todoroska, Snezana Risteska - Jovanovska, 'Dairy Sector In Republic of Macedonia– Yesterday, Today, Tomorrow', Economics of Agriculture 4/2015, UDC: 637.1(497.7),

represents an economic benefit to those that otherwise use chemical fertilizer, which should further underpin participation.

For the investor in a biogas plant, a number of other risks arise related to the energy sector. This, however, concerns the production of renewable energy and should ideally be dealt with in a separate report.

In principle, swine manure is treated the same way, but its water content is larger and thus it requires larger tank capacity to store the same amount of methane generating substance. 300 swine generates an amount comparable to 5 cows.

Table A- 76: Conversion of land use of field crops above 15% inclination

Mitigation action: Conversion of land use of field crops above 15% inclination

Main objective: To reduce the intensity of soil erosion and loss of soil organic matter

Description: Cultivation of land on inclined terrain causes intensive processes of soil erosion and mineralization of soil organic matter. These processes lead to intensive decomposition of soil organic matter and emission of soil carbon into atmosphere. Conversion of such areas into perennial grassland (pastures, meadows) will significantly decrease intensity of soil organic matter depletion and emission of soil carbon and will lead to carbon sink. Areas above 15% inclination by law should not be cultivated and are not considered as agricultural land. This conversion supposes land use change and change of the production system, which might influence the net annual income of primary producers. Due to this, its implementation should be supported with incentives, especially in the first years of conversion, in order to bridge possible loss of incomes in farm holds.

Table A- 77: Contour cultivation on areas under field crops on inclined terrains (5-15%)

Mitigation action: Contour cultivation on areas under field crops on inclined terrains (5-15%)

Main objective: To reduce erosion of top soil and conservation of soil organic matter

Description: Regular cultivation in crop production means a massive disturbance of top soil layer, which cause intensive mineralization of soil organic matter (SOM) and CO₂ emissions. Downslope cultivation of cropland usually causes intensive processes of soil erosion. Field experiments showed that the quantity of eroded sediment is multiply higher if compared to contour cultivation. This eroded sediment is rich with SOM which in such circumstances is rapidly mineralized, due to what significant quantity of soil carbon is released into atmosphere. Contour cultivation means that all agro-technical operations should be across the slope. This measure is easy to be implemented, since it does not require a special technical capacities and know-how. In practice, farmers usually are not aware of its importance and influence of the overall soil fertility. With a systematic campaign for increasing the awareness of the farmers this measure can be widely adopted.

It may be possible to introduce a swap model based on land in government ownership, offering smaller plots of better land in exchange for the inclined terrains. Thus, even if the plots offered are already forested and need to be deforested, there will be a net increase in forested area. Ideally, however, the government would be able to offer land that is either suitable for reforestation or for agricultural purposes. A swap model is risk free and thus does not require de-risking. No other risks are identified.

Table A- 78: Perennial grass in orchard and vineyards on inclined terrains (>5%)

Mitigation action: Perennial grass in orchard and vineyards on inclined terrains (>5%)

Main objective: Reducing of soil erosion and increasing of SOM in vineyards and orchards on inclined terrains (5-15% slope)

Description: In vineyards and orchard on locations where rows are oriented downslope, as a result of intensive classical system of cultivation, an intensive processes of soil erosion and depletion of SOM occur, which lead to intensive emissions of soil carbon. Simple change of cultivation system with establishment of perennial grass, can significantly mitigate the process of SOM loss and emissions of soil carbon. The measure is easy to be implemented with low initial cost.

This is a behavioural initiative, which requires no investment. De-risking is thus not relevant.

Table A- 79: Use of biochar for carbon sink on agricultural land

Mitigation action: Use of biochar for carbon sink on agricultural land

Main objective: Carbon sink by negative emission technology.

Description: The agricultural soils in the country are characterized as soils with relatively low carbon content and with average to low fertility. The application of biochar can improve soil water holding capacity, nutrients storage into the soil, and increase yield. Biochar can capture even 3 times more CO₂ compared to its weight, because of its high carbon concentration. Biochar was included for the first time as a promising negative emission technology in the new IPCC special report “An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty” published in 2018. The process of application of biochar should go through several steps: i) research, ii) development the suitable technology for various soil/crop combination iii) experimental/demonstrative sites, iv) development the measure for support from national programs for support of agriculture v) promotion of measure. This is new measure needs some research, therefore, in period 2017 – 2040 estimated only 15 years of active use of the measure.

It is premature to consider de-risking in this context as the practice needs further research. Even then, it seems mainly to be a behavioural initiative with no investment needed and thus not an obvious target for de-risking.

Table A- 80: Photovoltaic irrigation

action: Photovoltaic Irrigation

Main objective: Mitigation by replacing the non-renewable energy sources for water pumping with renewable, thus reducing the CO₂ emission.

Description: Installation of photovoltaic system for irrigation purposes with 2.4 kW installed capacity, capable to run 1.1 kW 3 phase pump. The two cases are considered as mitigation practice, replacing the petrol pump with consumption of 0,3l petrol per hour (one of the most popular pumps in the country) with 3 phase AC pump and adding photovoltaic and replacing 1.1 kW electricity pump with 3 phase AC pump and adding the photovoltaic. The measure is suitable for already established on farm irrigation systems, but also for new establishing of the irrigation systems with on-farm water source. The measure is compatible with IPARD 2 measure “Production of energy from renewable resources for self-consumption, through processing of plant and animal products from primary and secondary biomass (except biomass from fishery products) for production of biogas and/or biofuels, use of solar energy, windmills, geo-thermal energy etc”.

The replacement with solar PV based pumps of either fossil-fuelled generators for water pumping or electric pumps using grid electricity is, in principle, a renewable energy related initiative and as such not encompassed by this analysis.

Table A- 81: Establishing integrated management of forest fires

Mitigation action: Establishing integrated management of forest fires

Main objective: Reducing the average annual burned area for 6000 ha

Description: Forest fires are already detected as a very significant problem of forest loss and source of GHG emissions. In the period from 1999 to 2019 year the average annual number of forest fires is 229 fires, average annual burned area is 10,985 ha and average annual damage is estimated on 6,9 million Euro. The total burned forest area in the same period is around 219,163 ha with the total damage of around 138 million. This measure includes the protection of the forest area by preventing the forest fires and the damages resulting from forest fire

The initiatives A-81 and A-82 may well be seen in common, as the one may serve as a de-risking measure of the other. The prevention of forest fires is first and foremost considered a management issue and

not an investment. It serves as an insurance policy that comes with an operational cost (hopefully) lower than the 6.9 million € lost annually to the fires.

According to the statistical year book of Republic of Macedonia 2004³⁶, Public statistics institute of Republic of Macedonia, 90.14% of the total forest area in North Macedonia are in public ownership, while in the total wood reserve the Public sector participates with 92,20%. Private forests participate with 9.86% of total forest area and participate with 7.8% of the total wood reserve. Regardless of the ownership structure of North Macedonian forests, compulsory establishment of fire breakers through regulation is an option. It may be centrally organized and charged for by the Government. Or it may be (partly) be paid for through the value of the timber harvested from the established fire breakers. For privately owned forests, it is assumed that insurance is already offered in the market and that insurance companies are already differentiating their prices according to the management of the insured forests. For the publicly owned forests, establishment of fire breakers is an operational cost that may equally be (partly) paid for through the value of harvested timber.

This requires no de-risking. It is a de-risking measure in itself, the implementation of which is paid through reduced losses to forest fires and a one-time revenue from timber harvesting.

Table A- 82: Afforestation of 5000 ha of barren land with Oak (Quercus Spp.)

Mitigation action: Afforestation

Main objective: Afforestation of 5000 ha of barren land with Oak (Quercus spp.)

Description: Afforestation and reforestation may change landscapes and may have an impact on the provision of landscape-related goods and services. The supply with goods and services benefiting people and societies and the conservation of traditional cultural landscapes, as well as landscape ecology, need to be taken into account. According to the many strategic documents there are about 1,500,000 ha barren land aimed for afforestation or reforestation.

Investment in forests faces a number of risks, most prominently the one of forest fires as discussed above. Newly established forests can be planted with a view to minimizing this risk, but it cannot be avoided. International forest companies manage their forests uniformly across borders and manage 'nature based' risks professionally through management practices and diversification, although they do need to consider the management of neighbouring forests and the affiliated risks if these are badly managed. As mentioned above, therefore, A-81 is an important de-risking measure for the afforestation with oak. In addition to this and to the extent that North Macedonia is offering concessions for forestry rather than the sale of land, the contract conditions are essential, particularly the length of the concessions (minimum 50 years) and the compensation in case of termination. As such contracts are with the Macedonian government - the National Forests of North Macedonia - a contract would be insurable in the market. It is also likely that the size of a contract may fall within the scope of the Strategic Investment Law (SIL), allowing for the negotiation of specific investment conditions, including a focus on de-risking.

1.4 Waste

According to the National Waste Management Plan 2009 – 2015, the solid waste generated in North Macedonia is mostly disposed in non-compliant landfills. The landfill Drisla is the only permitted landfill but additionally to this, there are around 50 municipal non-compliant landfills; and solid waste is disposed of also in dumpsites or in rural areas.

³⁶ [Public Enterprise Macedonian Forests \(mkdsumi.com.mk\)](http://mkdsumi.com.mk)

In addition to the lack of appropriate infrastructure for final disposal, the current legislation and standards are not effectively enforced. The biggest waste generator is the mining sector (containing significant amount of hazardous substances). This sector is followed by the agriculture sector, generating animal manure and plant waste, the third biggest waste stream is Waste from thermal processes and this is followed by the municipal solid waste.

In general, waste collection, selection, and transport is insufficient in a number of areas to comply with the existing requirements. Mixed industrial and municipal waste, including hazardous fractions waste, is collected from the service beneficiaries. WM in general is low in productivity and cost inefficient. Recycling activities for municipal waste are very limited and without any organised approach. There is no initiative on the municipal level to organise selection and recycling of municipal waste. The recovery of recyclable materials such as metals, paper, plastics, car batteries and accumulators, waste oils etc., is undertaken by the informal sector.

Waste composting and anaerobic digestion are not in practice in North Macedonia. There is a local pilot composting facility, more composting is applied in agriculture by using known and controlled input material. Few existing facilities for anaerobic digestion aimed at the degradation of agricultural wastes and especially manure has not been in operation for many years. A large part of the plant tissue produced in agriculture is reused in an environmentally sound manner. The relatively high quantities of manure generated by cattle and sheep are completely used for soil fertilisation but without monitoring of the impact on the water environment.

Regarding to end disposal, almost the only method is deposition on landfills; only some hazardous waste from health institutions and some liquid hazardous waste are incinerated and co-incinerated, respectively. Most of the municipal solid waste and other collected waste is deposited at municipal landfills/dumpsites without any pre-treatment. Most of the packaging waste is disposed of on landfills or dumpsites as a constituent of municipal solid waste and similar commercial/industrial solid waste. Municipal waste that is not collected by official collection enterprises is disposed of at "wild" dumps.

The need for improvement of the waste management practices has been recognized in national, regional and local waste management strategic documents. Furthermore, there are around 1000 illegal disposal sites which need to be stopped.

In 2016, the GHG emissions from waste were 610.2 Gg CO₂-eq (Third BUR). The categories reported under Waste sector are Solid Waste Disposal, Biological Treatment of Solid Waste, incineration and Open Burning of Waste and Wastewater Treatment and Discharge. The emissions from the Solid Waste Disposal category are the most significant with 77.5% in the total GHG emissions in 2016. Considering the fact that most of the emissions are from Solid Waste Disposal Sides, as well as the forecasts for their growth as a result of the increased amount of waste that citizens are increasingly creating, special attention should be paid to this sector.

1.4.1 Current mitigation actions and Proposal of enhanced mitigation actions or new mitigation actions

The current MSWM in Macedonia is characterized by the predominance of non-sustainable waste practices, such as open dumping, open burning of waste, and non-compliant landfilling. Waste is collected without appropriate source separation and recycling rates are rather low and performed rather informally³⁷. Non-sustainable MSWMSs represent 6% of the total GHGs emissions of North

³⁷ Macedonia Waste Management Strategy

Macedonia (2016). To change this situation it is necessary to apply more CE oriented WM approaches, involving key stakeholders of the waste value chain, including the informal sector.

A number of studies highlight the potential of Circular Economy for carbon emissions mitigation in the waste sector. The more circular a WM measure is (targeting higher in the WM Hierarchy), the lower the carbon emissions related to that measure are. However, the GHG mitigation potential of these measures vary quite significantly depending on the type of technology, waste composition, climate, type of fuel to be replaced, and local energy mix, among other factors. Adding to those factors, there is the uncertainty in the GHG estimations of CE based WM strategies due to the methodology applied. Thinking in a "circular" way implies that WM strategies will potentially include and therefore impact other sectors of the economy. They also might create "industrial symbiosis" promoting material and energy flows and interactions between different product value chains (e.g. Biogas from biodegradable waste for energy use in closed located industries). Due to this, it might be not always possible to allocate GHG reductions to only to the WM sector in North Macedonia. In the example of recycling, the GHG reductions caused through replacement of raw material by recycled material maybe cannot be allocated in North Macedonia's value chain, but the effects might be seen on international value chain, where raw materials extraction are reduced.

Having said that and considering that currently around 77% of the total GHGs from the waste sector are generated in the disposal of solid biodegradable waste, this study proposes to look at this waste fraction more closely. Currently Macedonia has included mitigation measures targeting the last stages of the waste hierarchy. Apart of Landfill gas flaring (which is actually an end of the pipe measure for already generated emissions), North Macedonia focusses on waste valorization/recycling through MBT, treatment and separate collection of waste paper (mitigation measure 2 and 3 in the Third BUR). The only attempt to going further up to waste prevention is in the mitigation action 4, which proposes to improve waste and material management at industrial facilities, by setting mandatory and voluntary (higher) targets for waste reduction, recycling and treatment for industries and developing enabling mechanisms such as financial and tax incentives.

Going further than the current national mitigation measures, this document proposes to shift the Macedonian GHG mitigation strategy towards waste valorization of biodegradable waste (as conversion to fertilizers: composting and digestate from AD) and to energy recovery from waste (e.g. cogeneration, alternative solid fuel). This is aligned with the current national WM plan and strategy, both including the Waste hierarchy as a key principle. The mitigation potential of the mentioned measures can be allocated directly to the waste sector, as avoided waste treatment and final disposal. Emission reductions generated along products value chains (avoided extraction of raw materials), by replacing fossil fuel-based fertilizers, and the use of recovered energy will be most probably allocated in different IPCC sectors.

1.4.2 Potential for utilization of additional low carbon technologies

After a discussion with stakeholders from the Macedonian Waste Management sector, it was determined that this analysis should be focused on the sub - sector corresponding to Municipal Solid Waste Management (MSWM). The reasons for that decision were first, the absence of precise and updated data about waste flows generated from other sectors, such as the agriculture sector and the industrial sector generating Municipal - like waste. There is no detailed waste composition of those waste types.

The agriculture sector is the one generating the highest amount of biodegradable solid waste in North Macedonia. According to the information received, there is no waste collection system for the agricultural waste. This material is currently used on the fields or dumped in undetermined areas. The generation of agricultural waste is very disaggregated, from small farmers. For planning mitigation actions targeting agriculture waste, not only detailed data is needed, but also basic infrastructure should be in place, making possible to actually collect waste.

Table 4

Sector	Amount (Tonnes/year)	Possible treatment	expected outputs
Municipal waste	915 943	MBT consisting of: <ul style="list-style-type: none"> a) Sorting facility for separating recyclables (semi-manual) b) RDF pelletizing for light waste fraction and non-recyclables with high calorific value (c) AD + aerobic stabilization (for biodegradable fraction) d) Landfilling for inerts materials 	<ul style="list-style-type: none"> a) Recycled materials b) Electricity c) Heat d) Organic fertilizers (compost or fluid digestate) to be used in soil remediation, forestry, urban greening (depending on the quality of the final compost)

According to data provided by key stakeholders from the MSWM sector, North Macedonia generated 915,943 tonnes in 2019. The total MSW collected in that year was 632,484 tonnes and around 99.7% was disposed of in landfills. The average amount of biodegradable fraction is around 48%. Table 4 shows technological treatment options appropriate for MSW with high content of biodegradables.

Mechanical biological Treatment (MBT)

MBT usually involves a first treatment phase, corresponding to sorting of recyclable materials and a second one, which could be Anaerobic Digestion (AD) or composting for the biodegradable fraction. Dry recyclable materials are sold for recycling and the stabilized final compost as well as dry non-recyclable materials are landfilled or dried for its use as alternative fuel (refuse derived fuel - RDF) in incinerators or in industrial furnaces, such as cement kilns.

Owing to the combination of different treatment processes, MBT plans have an interesting GHG mitigation potential. MBT plants could save emissions by using biogas for energy generation, instead of fossil fuels. Furthermore, reintroducing recycled materials into production chains and product cycles avoids GHG emissions linked to the extraction of raw materials. Frequently, MBT plants are designed for the treatment of mixed waste or other kinds of non-clean organic waste (contaminated or with small pieces of glass, plastics, etc.). Therefore the stabilised organic output (compost) is usually not suitable for the agriculture. However, it has de same carbon storage potential as the standard compost. It should be noted that compost from MBT plans fed with waste separated at the source can be used as organic fertilizers as long as the compost quality is proven to be appropriate for that use.

MBT's GHG mitigation potential depends on the technology, waste composition, type of waste, local energy grid, use of final outputs, etc. However, compared to landfilling, MBT plans may save around 90% of methane emissions (UNEP, 2010). In OECD countries, MBT could reduce from 500 to around 2,000 kgCO₂e/tonne of municipal waste diverted from landfill (relative to baseline practices in 2030) (OECD, 2012).

RDF

Basically, the term of "Refused Derived Fuel" (RDF) is used to define any material that can be co-combusted and used as a secondary fuel in waste to energy plants and/or industry plants (e.g. cement kilns). Industrial solid waste is typically more homogeneous in its physical and chemical characteristics. In the context of co-combustion, those materials are named as secondary fuel, substitute fuel and substitute liquid fuel (SLF). Examples of these fuels include waste tyres, waste oils, spent solvents, bone meal, animal fats, sewage sludge, and industrial sludge (e.g. paint sludge and paper sludge). These terms can also refer to non-hazardous packaging or other residues from industrial/trade sources (e.g. plastic, paper, and textiles), biomass (e.g. waste wood and sawdust), demolition waste or shredded combustible residues from scrap cars.

Also some waste fractions coming from Municipal Solid Waste (MSW) can be used as RDF. Materials such as paper, plastic, packaging and other materials (separately collected but too contaminated to be recycled) can be used as secondary fuel. The MSW composition has an enormous influence on the physicochemical features of RDF, such as heat value, moisture, etc. The higher moisture content in waste, the less calorific value has the resulting RDF. In Europe, producing RDF from MSW does not represent a big challenge, due to the appropriate waste composition (low organic fraction, high inorganic dry fraction). This might not be the case of MSW generated in countries like North Macedonia, where MSW is not being separated at source and is characterized by higher amounts of organic waste and low contents of dry fraction. In addition to this, the informal waste sector performs recycling activities, so the dry fraction in the MSW becomes even lower.

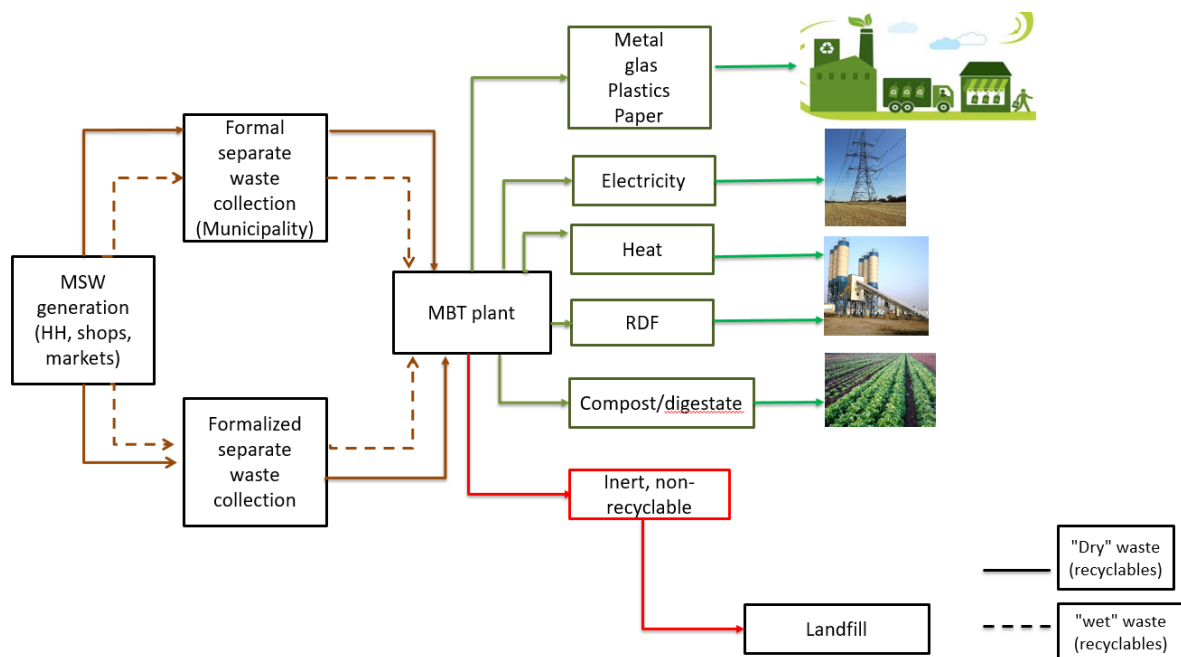


Figure 4 Proposed Material Flows for Mitigation actions in the MSWM sector

The RDF from MSW is frequently produced by mechanically separating the waste fractions with high calorific value (non-recyclable plastics, paper, and cardboard) from the fractions with low calorific value (organic matter with high water content, inert materials). The Mechanical Biological Treatment (MBT) is the most applied technology for producing RDF from MSW with a higher organic fraction.

Depending on the waste quantities and composition, the mechanical treatment of an MBT plant will involve mechanical separation (separation of recyclables), size reduction (shredding, chipping and milling), separation and screening, blending, drying and pelletizing (for light fraction with high calorific value). For the fine waste fraction (mainly organic fraction with some non-recyclable dry fraction) separated after the mechanical treatment, the MBT offers Anaerobic digestion or aerobic stabilisation (MPS) (similar to composting).

In biological treatment processes, metals and inerts are separated out and organic fractions (containing some non-recyclable dry waste) are screened out for further stabilisation using composting processes, either with or without a digestion phase. It also produces a residual fraction which has a high-calorific value as it is composed mainly of dry residues of paper, plastics, and textiles (non-recyclable dry fraction). This can also be used as RDF.

1.4.3 Key elements (existing) that can influence on the results of current and proposed mitigation actions

Every WM system operates under specific context and conditions inherent to the system itself, such as legal and policy frameworks, technical, economic, and social contexts, market conditions for specific resources within waste streams, and others. These conditions can influence in the way in which WM systems are implemented and which direction they take (e.g. towards Circular Economy, or focussed only to "end of the pipe" WM approaches). This include also the kind of technologies and low carbon solutions targeted.

Absence of MSW waste separation at source:

MSW generators, such as households (HH), commerce, restaurants, and others, do not segregate their waste. There is no separation at source scheme, which allows end-consumers to segregate different waste materials (e.g. separating wet from dry waste, nor glass from paper, etc.). This causes a detriment of quality of potentially recyclable waste materials, lowering their market value and also making them less suitable for recycling. This happens also for biodegradable waste that could be transformed into high quality compost. For example, if biodegradable waste is exposed to HH hazardous waste such as paintings, batteries, car oils, etc. the resulting compost will not be suitable for its use as organic fertilizer.

Absence of MSW separated waste collection:

There is no separate waste collection. Waste separation and recycling is done mostly informally and it is driven by market conditions. This might influence in the quality of the organic fertilizers (compost or digestate from Anaerobic Digestion (AD)), also on the amount of marketable recycled material as mixed collection tends to contaminate recyclable materials reducing their quality. The absence of source separation (in Macedonia) may affect the final quality of compost, preventing it from being used as fertilizer and replacing chemical fertilizers. In this case, the mitigation potential due to avoided energy use from raw material extraction for fossil fuel based fertilizers is not exploited.

Strong presence of the Informal Waste Sector:

Inefficient formal WM systems open opportunities to informal WM activities. There is a strong informal waste sector in Macedonia. There are some recycling activities in the informal sector with a growing tendency due to the increased interest of numerous small private companies to get involved in the recycling business. Informal recyclers are able to extracting recyclable materials with higher quality and therefore with higher market value, before the waste even reach the disposal sites. It is known that, the informal sector contributes positively to alleviate some environmental and socioeconomic issues related to inefficient MSW, for example, job creation, creation of local added value, alleviation of economic burden for the formal WM sector (by reduction of pressure on landfills volumes, less collection and infrastructure costs, GHG reductions through recycling). Due to this, current and future

mitigation actions should involve the informal waste sector actively. This will allow to use their capacities, current knowledge, creating at the same time, stable jobs and incomes for informal waste workers, and social inclusion and social endorsement of projects.

At the same time, mitigation actions should include measures to address current socioeconomic problems affecting the informal waste sector in Macedonia (discrimination, bad working conditions, child labour, and others), making possible their effective and sustainable integration to the formal waste management value chain. There have been some attempts to integrate informal waste workers, however those attempts have been reported as unsuccessful. In that sense, future mitigation actions should apply a participative approach, where integration strategies are developed in close cooperation with informal workers.

Insufficient waste collection coverage, high WM costs and low willingness to pay waste collection and gate fees, absent WM treatment and high waste disposal rate

Based on the amounts of waste collected versus waste generated, the average waste collection rate for MSW was estimated to be around 69% (2019)³⁸, this estimation considers waste collected in rural and urban areas. Comparing the waste collection rate with other countries in Europe, the Waste collection in Macedonia is still insufficient. This situation is also opening doors to the participation of informal waste workers, who would informally provide waste collection service in locations where the formal service is not in place. The reasons for the relative low waste collection rate might be from technical and infrastructure reasons (areas with difficult access, lack of collection trucks) to socio economic e.g. lack of willingness to pay collection fees and therefore reluctance to use formal WM services, lack of economic resources from municipalities to increase the collection coverage. This last aspect might be relevant for the case of Macedonia's MSWM system, in average only a maximum of 75% of the population served is paying the waste collection fee. Adding to this gap, the waste collection fee per tonne established by municipalities does not correspond to the actual MSWM cost (covers only up to 75% of the costs per tonne).

The situation described above means that municipalities are currently facing an important economic gap, not allowing them to improve the existent MSW services. Collection rates remain lower than they should and almost 99.7% of the total collected MSW is disposed in landfills³⁹.

Current waste recycling activities are not financially attractive if performed by the formal WM sector. The current waste fees do not cover the recycling costs and for example, the logistical costs for a formal recycling system for paper are just covered by the sales price of paper⁴⁰.

Possible mitigation actions on the MSWM sector should consider the possibility to increase the waste collection rate, in order to achieve higher amounts of waste diverted from landfills to be used as input material for waste treatment plants (e.g. MBT, AD, composting). Low carbon projects should include strategies to increase waste collection and the quality of collected materials e.g. cooperation with a "formalized" informal sector, financial support for improving municipal waste collection fleets, or supporting formalized waste workers associations, social awareness aiming at increasing willingness to pay among WM users. Furthermore, Mitigation projects in the waste sector should also consider (in cooperation with municipalities) to re-estimate MSWM costs and redesign waste collection fees, following the "polluter-pays-principle/pay as you throw". This approach would also incentivize MSWM users (households and others) to reduce the amount of mixed waste and to increase amounts of recyclable waste fractions.

³⁸ State Statistics Office, No: 9.1.20.02, (2020)

³⁹ State Statistics Office, No: 9.1.20.02, (2020)

⁴⁰ Waste Management Strategy 2008 - 2020

MSWM mitigation actions should consider the participation of the private sector in providing MSW services, where revenues are diversified and based not only on fair waste collection rates based on "polluter pays" principle but also on the sales of recyclable materials. In this sense, the collaboration with formalized waste workers (Informal sector) becomes key for utilizing their capacity of accessing difficult locations, their knowledge of materials quality and of the local recycling market and mechanisms.

Waste composition of MSW:

Recent data collected by regional waste management plans around in North Macedonia report an average biodegradable fraction of 48% in the MSW. This shows that the MSW in North Macedonia has a relevant biodegradable waste fraction with high water content, which makes this waste more suitable for reutilization based on biological treatments and not on thermal treatments such as waste incineration. Future low carbon projects in the waste sector should not include thermal treatments such as incineration, unless the biodegradable fraction is separated.

Current WM policies and regulations:

Currently, there is no legal framework in North Macedonia that addresses and regulates exclusively waste management for biodegradable waste. Moreover, there is no specific waste valorization targets (e.g. % of biodegradable waste diverted from landfills, % recycling rate, energy generation from biomass by 2020, 2025 or 2030). Even though the Waste Hierarchy is mentioned as a key principle in the Waste Management Strategy and the WM Plan, there are no specific measures or actions addressing the higher levels of this hierarchy, such as waste prevention, re-use or recycling.

International experiences (especially in EU) have showed the importance of including goals and specific targets for WM. For example, the European WM legislation and environmental legislation related to this sector (e.g. resource efficiency, CE plan, etc.) include specific targets addressing different stages of the Waste Hierarchy (for reducing landfilling of untreated waste, for increasing recycling rates in 2020, 2025 and 2030, waste reduction by half by 2050). These specific goals open doors for development and implementation of WM projects that add to the completion of those targets. In addition, it should be highlighted that goals and targets also come hand in hand with the establishment of enabling conditions to achieve those targets, such as implementation of tax incentives for the private sector, new financing funds, capacity building, and research, penalties, among others.

It is important that Macedonia consider also identifying what goals and targets should be established for the waste sector, and include those into North Macedonia's WM policies and legislation.

Current Waste treatment technologies

North Macedonia has existing know - how about AD technologies. However the first two installations with relative high capacity were constructed in the mid 80's and have only been in operation for a short period of time. Other AD plants are small and use manure mixed with straw as feedstock⁴¹. However in the MSW sector, the predominant waste technology option is landfilling.

The Macedonian NDC proposes the technical improvement of landfills (landfill gas capture and flaring), MBT plants with composting facilities. However, there are some other technology options for MBT plants that include also AD, Refused Derived Fuel (RDF). Both can generate energy in different forms (electricity, heat, solid fuel) that can be replace fossil fuels and reduce even more GHGs emissions. In the economic side, this would diversify revenues flows from mitigation projects reducing also the risk linked to technologies with higher investment.

⁴¹ Waste Management Strategy 2008 - 2020

1.4.4 De-risking Waste initiatives

Table A- 83: Landfill gas flaring

Mitigation action: Landfill gas flaring

Main objective: Environmental protection and meeting the highest European standards

Description: Rehabilitation of the existing non-compliant landfills and “wild” dumpsites with very high, high and medium risk in each of the five waste management regions. The rehabilitation includes covering on the existing non-compliant landfills, supplemented by gas extraction and flaring. This measure depends on the realization of the measure “Mechanical and biological treatment (MBT) of waste in new landfills with composting”, because the opening of the new regional landfills should incorporate systems for mechanical and biological treatment together with gas flaring system. At the same time the opening of the new regional landfills will result in closure of the existing non-compliant landfills and “wild” dumpsites.

Landfill gas flaring was among the most profitable interventions when there was thriving market for carbon offsets through CDM and JI. Flaring alone was the most profitable as the cost of implementation was low and the revenues from converting methane into CO₂ through flaring high. Less profitable were landfill gas projects with energy production using methane to run gas engines. With no price on carbon, obviously the calculation is different. There is no revenue from flaring, unless the public sector or the (municipal) owner of the landfills decide to pay for flaring. Thus, investors would depend on the validity of a contract for flaring or, more likely, just a contract for installing a flaring system and leave the simple operation of it to the landfill owner. This would be a simple commercial purchase that requires no de-risking.

Alternatively, a concession is offered for energy production. Depending on the methane extraction potential, such concessions may or may not require additional payment to the concessionaire. As methane extraction potentials decline over time, such concessions will have clauses on methane extraction levels linked to duration or payments or both. Power generation equipment is likely to be semi-mobile.

Such contracts are risky affairs. There are technical risks as to the methane extraction potential. There are risks affiliated to the concession with a local authority. And there are risks linked to the electricity market. Some countries resort to regulation, making methane flaring from landfills mandatory - some even mandating the utilization of methane for energy production. Such regulation could assist in aligning interests, but are unlikely to eliminate risks and projects are generally too small to qualify as Strategic Investments. Looking at the EU, there is no immediate model solution on the horizon. The European Commission presented an EU strategy to reduce methane emissions⁴² as late as 14th October 2020, stating that 'in the waste sector, the Commission will consider further action to improve the management of landfill gas, harnessing its potential for energy use while reducing emissions, and will review the relevant legislation on landfill in 2024', including technology options.

Not awaiting further EU initiatives, two pieces of regulation may help the sector forward. 1) Issuing regulation that mandates flaring will create a baseline for landfill owners in terms of costs. And 2) including land fill gas based power production in the energy law with a specific feed-in tariff, thus avoiding its direct competition with solar and wind technologies. While these initiatives are mostly reducing commercial risks by establishing a demand side both upstream and downstream for a 'landfill

⁴² Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions on an EU strategy to reduce methane emissions, see https://ec.europa.eu/energy/sites/ener/files/eu_methane_strategy.pdf

gas to energy' operator, they do in themselves also reduce regulatory risk through certainty. Otherwise, there is no regulatory basis on which to build such projects. Experienced contractors may bring model contracts to such a market, but contract risks particularly in the role as concessionaire remain. In this respect, it may be possible to introduce the national grid operator, MEPSO, as a co-concessionaire from the perspective that should the local authority unrightfully decide to terminate the concession, it effectively makes the PPA null and void. A three-partite agreement is no ultimate protection against contractual risks (and may create additional ones), but it may provide further comfort to potential (foreign) investors.

Table A- 84: Mechanical and biological treatment (MBT) of waste in new landfills with composting
Mitigation action: Mechanical and biological treatment (MBT) of waste in new landfills with composting
Main objective: Environmental protection and meeting the highest European standards
Description: Opening of new regional landfills in all waste management regions with installed system for mechanical and biological treatment and composting.

The link to the above initiative A-83 is straightforward in the sense that new landfills will leave the old ones for closure and easier operation of methane extraction (which is why new landfills are normally compartmentalized). Apart from that, however, the link is limited. A-84 entails no energy production, as the approach is methane avoidance through aerobic composting. Thus, there is no need for flaring either. The activity, therefore, is only related to waste management, which comes with a number of challenges.

The current mitigation action targets mostly waste disposal without addressing prevention and recycling higher in the waste hierarchy. If collection and treatment is charged according to weight, new waste management facilities may face the risk of falling amounts of waste, if prevention and recycling become targets later.

At the same time, there is no waste separation at source, which affects the quality of recyclable materials, including biodegradables for compost. As a minimum, biodegradables must be separated, but any introduction of separation at source comes with the risks of non-compliance and non-enforcement. Fines for non-compliance may be introduced in the industrial sector where waste amounts are larger and easier detectable, but this on the other hand entails risks of illegal dumping. There are cash-flows in the sector, but only 75% of the costs are covered by the WM fee and only up to 75% of the users pay fees. Only 69% of due fees are collected, which interestingly indicates that the fee level and (probably) structure is adequate: If all fees were collected, all costs could be recovered.

A way to increase the payment percentage of waste fees is to changing payment modality to combine it with other utility costs, like electricity and water and/or property taxes e.g. on a quarterly basis. Default on a combined invoice would render the payee in default on all services with potential closure of all services if non-payment persists. Such instruments, however, would be for the public sector to operate and not any private concessionaire, if inviting private investors into waste management. This again indicates that the public sector is almost certainly required to assume the payment risk on consumers and offer a fixed price concession to a private operator, setting conditions on the waste treatment, and possibly success fees upon the achievement of separation goals.

In order to assure the public sector of flexibility in the choice of operator, fixed installations must be financed and owned by the municipality, alternatively established on separate BOT contracts (separate from the operational concessions). Such facilities contracts are separate 'risk centres' for a BOT investor, assuming the counterparty risk on a regional/local authority. With these costs separate from the concession on waste collection reduces the risk on the latter considerably. It may be that the concessionaire brings the collection material (garbage trucks), which can be evacuated in case on non-

payment. Therefore, the risk on a concession once the physical installations are separated is probably limited.

It is conceivable that a national initiative for uniform waste collection practices based on standardized waste management centres could amount to a Strategic Investment under SIL for which specific investment conditions could be organized with a sovereign guarantee covering a BOT-contract for the construction of a number of facilities, but this is speculative and needs further consideration before a specific de-risking model could be contemplated. Without it, local authorities may consider public investment into those facilities and an increased fee collection rate to finance such investment together with concessions for waste collection.

A final risk element is the informal sector, which currently is extracting a sizeable share of the valuable waste fractions. In principle, this is a quality that should not be lost and these agents are maximizing the value of the useful fractions. Any increase in waste collection coverage may therefore be organized to also benefit the informal sector through shared revenues. As long as an improved waste collection system is not depending on revenues from selling valuable fractions extracted in competition with the informal sector, any additional revenue obtained in a shared profit model will probably protect concessionaires from unrest. De-risking in this respect, therefore, is mostly linked to a collaboration structure with incumbent 'waste managers'.

Table A- 85: Selection of waste - paper

Mitigation action: Selection of waste - paper

Main objective: Environmental protection and meeting the highest European standards

Description: Installation of containers for collection of selected waste, mainly paper

Table A- 86: Improved waste and materials management at industrial facilities

Mitigation action: Improved waste and materials management at industrial facilities

Main objective: Set targets for the reduction of generation, selection, reuse, recycling and treatment of waste at industrial installations

Description: On an individual assessment, each IPPC installation operator shall submit proposals for 1) waste generation, 2) waste selection, 3) waste reuse, 4) waste recycling, 5) waste treatment. Goals are set in integrated environmental permits. Goals are set for a 5-year framework (progressive goals for each year) that will be updated as appropriate after the deadline.

Two levels of goals: mandatory and higher incentives (through tax or financial incentives).

In principle, A-85 and A-86 should be considered elements in a larger waste management system where the final deposit of waste (A-84) is minimized through a set of targeted initiatives. It is unlikely that single elements such as these two can be made subject of separate private investment, particularly not when they are targeting the valuable fractions that are already addressed by the informal sector. De-risking these two components separately is therefore not considered feasible.

1.4.5 Other options within Waste

The enhanced NDC does not consider waste water treatment although this is a common target for emissions reduction due to methane emissions from treatment plants. Agreed in December 2019, EBRD is providing a EUR 58 million loan, complemented by a EUR 68 million loan from the European Investment Bank (EIB) and a EUR 10 million investment grant provided by the EIB's Economic Resilience Initiative to establish a waste water treatment plant (WWTP) covering 80% of Skopje's 650,000 inhabitants.

WWTPs may be constructed not only to generate sufficient electricity to cover their own consumption mostly for water pumping, but also to become net energy suppliers based on methane extraction from waste water treatment. It is essential that this be considered from the outset in order to optimize the design of the plant. Retrofitting, although possible, will require additional investment. Copenhagen, a capital of comparable size, has already achieved self-sufficiency of energy supply and keeps optimizing its WWTP in order to become net power supplier by 2025.
