STATE OF PALESTINE

Co-benefits of Adaptation and Mitigation Actions Included in the Nationally Determined Contributions (NDC) Under United Nations Frame Work Convention on Climate Change

Introduction

The State of Palestine's Nationally Determined Contributions can have a range of other benefits alongside addressing the risks posed by climate change or reducing greenhouse gas (GHG) emissions. These are known as co-benefits and can take the form of environmental (e.g. air pollution, water pollution, noise, biodiversity), social (e.g. employment, health, safety) or economic (e.g. costs to businesses, road-traffic congestion, growth and investment, competition) impacts. These co-benefits are often overlooked in the assessment of climate change actions, but are an important element of the case for adaptation and mitigation.

Mitigation

The analysis of co-benefits from mitigation actions was focussed on the conditional mitigation actions included in the mitigation component of the NDC. These mitigation actions were taken from the Initial National Communications Report (INCR), and the underpinning data for the mitigation actions were taken from the Long-range Energy Alternatives Planning (LEAP) model. For each of these mitigation actions the potential co-benefits were identified and assessed using expert judgement informed by a literature review that included the following sources:

- Niklas Höhne, Thomas Day, Gesine Hänsel, Hanna Fekete (2015), Assessing the missed benefits of countries' national contributions: Results and methodology to quantify the possible co-benefits from ambitious greenhouse gas reductions of countries, New Climate Institute, available at: http://cdmcobenefits.unfccc.int/Pages/SD-Reports.aspx
- Ricardo-AEA (2013), Review of the impacts of carbon budget measures on human health and the environment, Report for Committee on Climate Change (UK), available at https://www.theccc.org.uk/wp-content/uploads/2013/12/AEA-Review-of-the-impacts-of-carbon-budget-measures-on-human-health-and-the-environment.pdf
- A review of the CDM Sustainable Co-Benefits description reports available at http://cdmcobenefits.unfccc.int/Pages/SD-Reports.aspx

The mitigation actions and their associated co-benefits are summarised in Table 1 below. For each action, the drivers and assumptions which lead to a realisation of co-benefits are described, as well as a relative score for the potential impact of the co-benefit. Describing the drivers and assumptions which make up the causal chain leading to a co-benefit is an essential step in ensuring the analysis is transparent, replicable and can be added to at a later date. The scoring was based on the mitigation action as described in the LEAP model and the strength of the assumptions that lead to the co-benefit. The impact was scored as either 'Low', 'Medium', 'High' or 'Uncertain' where there was insufficient evidence.

It can be seen from this analysis that co-benefits linked to improved air quality, less traffic congestion and reduced energy imports are likely to be the most significant if the mitigation actions as described in the NDC are undertaken.

Table 1: Co-benefits of mitigation actions

Sector	Mitigation action	Driver of co-benefit	Co-benefit	Key assumptions	Impact of co-benefit
Renewable energy (general)	Solar energy	Reduction in imported energy	Cost savings of imported energy (although perhaps offset by import of solar technologies and the uncertain impact of unit costs of electricity) Increased energy security Less exposure to shocks in international energy markets Improved balance of payments	Scale dependent on extent to which renewable energy offsets imported energy Trading ongoing fuel costs for upfront capital investments, assumed this risks exposure over time.	High
		Transition away from fossil fuel power plants and subsequent improvement in air quality	Health (human and environmental) benefits from improved air quality	Scale dependent on rate at which renewable reduces demand from other forms of generation.	Medium
		Decentralised power network	Reduction in need to upgrade the transmission grid and therefore cost savings Reduction in losses and theft of electricity	Solar energy results in a decentralised network	Uncertain
		Development of domestic renewable energy industry	Job creation	Development of renewable sector offsets any job losses	Medium

Sector	Mitigation action	Driver of co-benefit	Co-benefit	Key assumptions	Impact of co-benefit
			Income generation	in use of fossil fuel	
	Solar storage	Reliable lighting associated with solar storage	Improved leisure, work opportunities with associated health and economic benefits	Solar storage rolled out to allow battery powered lighting	Uncertain
Transport sector (general)	Natural gas for vehicles, Hybrids	Air quality improvements from less polluting transport modes	Health benefits (human and environmental)	Change in fuel type is sufficient to result in significant air quality improvements.	Low
		Less fuel used and cheaper fuel source	Lower fuel costs	Natural gas and hybrids are cheaper to run than petrol/diesel cars. Assumes no issues with natural gas supply	Low
	Modal shift	Air quality improvements from less cars on road	Health benefits (human and environmental)	Reduction in the number of cars on road is sufficient to result in significant air quality improvements	High

Sector	Mitigation action	Driver of co-benefit	Co-benefit	Key assumptions	Impact of co-benefit
		Less congestion	Time saved and subsequent improvements in productivity and leisure Health benefits (stress) Reduction in road accidents	Reduction in number of cars on road is sufficient to result in significant alleviation of congestion	High
Waste sector (general)	Waste to energy (cement) Energy from waste for electricity generation	Reduction in energy imports	Less reliance on energy imports Increased energy security Less exposure shocks in international energy markets Improved balance of payments Development of local	Waste generates sufficient energy to reduce energy imports Sufficient regular supplies of waste are available	Low
		Development of domestic market for energy	Income generation and job creation	Domestic energy generation results a profitable enterprise	Low

Sector	Mitigation action	Driver of co-benefit	Co-benefit	Key assumptions	Impact of co-benefit
	Reduction in methane from landfills	Reduction in ozone from methane	Health benefits (global)	Methane reductions are significant	Low
		Reduction in odour	Health benefits (local)	Reduction in methane reduces odour	Low
Energy efficiency	Building energy efficiency (including efficient lighting)	Reduction in energy use	Cost savings for businesses and people	Energy consumption falls as a result of energy efficiency action	Low
		Reduction in imported energy	Cost savings of imported energy Increased energy security Less exposure shocks in international energy markets Improved balance of payments	Energy consumption falls and as a result demand for imported energy falls.	Low
		Improved temperature regulation	Health benefits Improved productivity	Efficient green buildings regulate temperature effectively	Medium
Afforestation	Afforestation	Enhanced ecosystem services (reduced soil erosion, water quality, water regulation, recreational benefits)	Resilience provided by the improved ecosystem service. Health benefits provided by natural environment space for recreational	Sufficient scale and proximity of afforestation to populations to realise ecosystem service benefits.	Medium

Sector	Mitigation action	Driver of co-benefit	Co-benefit	Key assumptions	Impact of co-benefit
			purposes		

Adaptation

The analysis of co-benefits from adaptation actions was focussed on the conditional adaptation actions included in the adaptation component of the NDC. These adaptation actions were taken from the National Adaptation Plan (NAP). Analysis of the co-benefits of adaptation actions was undertaken as part of the NAP, in consultation with national stakeholders in relation to each of the 12 'highly vulnerable' sectors for the West Bank and Gaza Strip. Co-benefits of adaptation options within each sector were described and given relative scores of 'Negative', 'Low' 'Medium' or 'High. Specifically:

- **Co-benefits for adaptation in other sectors** –Describes the extent to which each adaptation option delivers potential co-benefits for adaptation outside of the 12 'highly vulnerable' sectors, including contributing to national development goals. The scoring reflects the adaptation options most important implications for other sectors.
- **Co-benefits for mitigation** – Describes the extent to which each adaptation option will reduce GHG emissions. A 'Negative' score indicates that an adaptation option could actually increase GHG emissions.

The extent to which each adaptation option addresses a 'highly vulnerable' issue, by reducing climate sensitivities and/or increasing adaptive capacities, drives the direction and significance of co-benefits. These co-benefits were an integral consideration to the prioritisation of adaptation options in the NAP and their scores in combination with scoring of other criteria led to an overall ranking of adaptation options for each sector. Systematic development of the NAP in close consultation with national sectors from across all sectors, including involvement in scoring co-benefits, helped to secure buy-in from all relevant ministries.

The adaptation actions and their associated co-benefits are summarised in Table 2 below.

Table 2. Co-benefits of adaptation options for other sectors and for mitigation

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
West Bank					
Agriculture					
Irrigation water	*Improve water-use efficiency and using alternatives water resources*	Improved family income, sustainable water resources, and better human health	High	Carbon costs associated with installation and operation may be offset to some degree by increased soil organic matter.	Low
Grazing area and soil erosion	*Land-use planning and management - greening, afforestation, and rangeland development*	Increased water resources, reduced diseases, reduced social conflict, improved habitat connectivity of terrestrial ecosystems.	High	Carbon costs of terracing may be offset by tree growth, appropriate grazing management and reductions in soil erosion, which may deliver reductions in carbon emissions.	Medium
Irrigated vegetables	*Enhance sustainable community-level irrigation schemes and infrastructure*	Increased food production, better human health, improved governance.	High	Carbon costs associated with installation and operation may be offset to some degree by increased soil organic matter and increased energy efficiency of the irrigation systems through reduced leakage	Low

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
				and improved water productivity.	
Livestock production	*Increase the availability of animal feed (including plant and organic residues) at an affordable price*	Increased food production, better human health.	Medium	Carbon costs will be associated with construction.	Negative
Livestock production	*Improve livestock-production pens*	Increased food production, better human health. Improve family income.	Medium	Carbon costs will be associated with construction	Negative
Production of olives, grapes, stone fruits, rain-fed vegetables and field crops	*Climate-smart agriculture*	Increased food production, better human health, and increased water resources.	High	Carbon costs associated with landscape management will be offset to some degree by increased soil organic matter, vegetation and tree cover.	Low
Production of olives, grapes, stone fruits, rain-fed vegetables, field crops and	*Agricultural disaster risk reduction and management (DRR/M)*	Ensuring food security and reducing volatility of local food access and prices (food sector). Reducing the impacts of climate change in the water sector.	Medium	Neutral	Low

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
livestock					
Energy					
Domestic/local energy production	*Generation of solar electricity for medium-large scale commercial and industrial application*	Increased security of energy supply will be beneficial to many sectors, e.g. industry, water, agriculture etc.	High	Solar electricity would reduce GHG by replacing fossil fuels.	High
Domestic/local energy production	*Implement energy efficiency measures to reduce consumption, mainly for commercial and industrial application*	Energy efficiency measures benefit all sectors by making more energy available and reducing costs. Hence, energy efficiency measures could be specifically implemented as an adaptation option in any sector.	High	Reducing energy consumption through energy efficiency would help to reduce GHG emissions.	High
Energy imports	*Use of renewable energy such as solar to reduce imported energy.*	Increased security of energy supply will be beneficial to many sectors, e.g. industry, water, agriculture etc.	High	Using renewable energy whether for electricity or thermal applications would reduce GHG by replacing fossil fuels.	High
Energy imports	*Implement energy efficiency measures to*	Energy efficiency measures benefit all sectors by making more energy available and	High	Reducing energy consumption through energy efficiency helps to	High

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
	reduce consumption and hence imported energy	reducing costs. Hence, energy efficiency measures could be specifically implemented as an adaptation option in any sector.		reduce GHG emissions.	
Condition of infrastructure	*Electricity grid upgrading*	Increased security of energy supply will be beneficial to many sectors, e.g. industry, water, agriculture etc.	Medium	Reducing electricity losses by upgrading the grid reduces the amount of energy generation required and thereby helps to reduce GHG emissions.	Medium
Condition of infrastructure	*Building fossil-fuel storage facilities*	Increased security of energy supply will be beneficial to many sectors, e.g. industry, transport, agriculture etc.	Low	There will be a carbon cost associated with building fossil-fuel storage facilities and they could a source of GHG emissions from leakage and evaporation.	Negative
Food					
Domestic food prices	*Enhancing agricultural value chain by improving infrastructure for livestock-production*	More abundant food at more affordable prices would directly and indirectly deliver benefits for many sectors, e.g. health, industry, etc.	High	There will be carbon costs associated with improving infrastructure for livestock-production pens and their maintenance but they will be offset, at least to some degree, by a reduction in food imports and associated	Negative

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
				emissions.	
Domestic food prices	*Greenhouse management*	More abundant food at more affordable prices would directly and indirectly deliver benefits for many sectors, e.g. health, industry, etc.	Medium	There will be carbon costs associated with erection of greenhouses and their maintenance but they will be offset, at least to some degree, by a reduction in food imports and associated emissions.	Negative
Domestic food prices	*Construction large-scale cold storage*	More abundant food at more affordable prices would directly and indirectly deliver benefits for many sectors, e.g. health, industry, etc.	Medium	There are likely to be carbon costs associated with construction and operation.	Negative
Imported food prices	*Construct large-scale steel silos for grain to enable import and storage during periods when prices on the international markets are low*	More abundant food at more affordable prices would directly and indirectly deliver benefits for many sectors, e.g. health, industry, etc.	Medium	There are likely to be carbon costs associated with construction and operation.	Negative
Gender					
Major diseases	*Increasing the*	Increasing the awareness of people,	High	Measures taken by people as a result	Low

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
related to water, sanitation, and food	*awareness of people, particularly women, in water-poor areas of measures they can take to help prevent major diseases related to water, sanitation, and food*	especially women, of the potential impact and measures that they can take to prevent it will directly benefit a number of sectors (e.g. health, water, and food) and deliver indirect benefits more widely (e.g. to industry).		of the awareness campaigns might deliver some carbon benefits (e.g. in relation to domestic waste management)	
Health					
Major diseases related to water, sanitation, and food	*Development of water, food and sanitation monitoring and safety systems using high technology*	Development of water monitoring and safety systems using high technology will also directly benefit the water and agriculture sectors.	High	No	Low
Major diseases related to water, sanitation, and food	*Training health professionals and increasing the awareness of people, particularly women, in water-poor areas about*	Training health professionals and increasing the awareness of people, especially women, about the potential impact and measures that they can take to prevent it will directly benefit a number of sectors (e.g. health, water, and food) and deliver indirect benefits more widely	Medium	Measures taken by people as a result of the awareness campaigns might deliver some carbon benefits (e.g. in relation to domestic waste management)	Medium

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
	measures they can take to help prevent major diseases related to water, sanitation, and food	(e.g. to Industry).			
Industry					
Value of raw materials imported	*Replace imported raw materials with local materials whenever possible*	A range of sectors might benefit, including agriculture.	High	Reduced demand for transportation would reduce GHG emissions.	Medium
Infrastructure	*Improve water supply through wastewater collection and treatment systems*	Other sectors will benefit, most notably water and health.	Medium	Limited benefits	Low
Energy supply	*Providing reliable electricity supply*	Increased security of energy supply will be beneficial to many sectors, e.g. industry, water, agriculture etc.	High	Reducing electricity losses by upgrading the grid reduces the amount of energy generation required and would thereby help to reduce GHG emissions.	Low

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
Energy supply	*Building fossil-fuel storage facilities*	Increased security of energy supply will be beneficial to many sectors e.g. transport, agriculture etc.	Medium	There would be a carbon cost associated with building fossil-fuel storage facilities and they could a source of GHG emissions from leakage and evaporation.	Negative
Energy demand	*Reducing energy consumption through introduction of modern production technologies*	The energy sector will benefit from reduced demand, which will also benefit many other sectors.	Medium	Reducing energy consumption through use of modern production technologies would help to reduce GHG emissions	Medium
Terrestrial ecosystems					
Habitat connectivity	*National network of protected areas, including 50 protected areas and 51 biodiversity hotspots*	Establishing a national network of protected areas will maintain and restore the delivery of a wide range of ecosystem services across sectors. For example: • Agriculture/food - maintaining pollination, soil fertility/protection • Energy - wood fuel (29% of Palestine's energy comes from firewood) • Health - encouraging mental well-being	High	Establishing a national network of protected areas will increase carbon sequestration and storage associated with land use land-use change and forestry (LULUCF), as a result of soil protection, maintenance of vegetation cover and increased tree cover	High

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
		• Tourism - landscape aesthetics and ecotourism • Urban and infrastructure - Sustainable Urban Drainage Systems (SUDS), urban cooling, green infrastructure • Water - maintaining ground water and surface water quality and quantity, reducing and delaying flood flows			
Tourism					
Condition of cultural heritage	*Identify, design and implement flood management schemes for cultural heritage sites, where appropriate*	Other sectors will benefit from a reduction in flood risk within the area addressed by each flood management scheme.	Medium	There may be a carbon cost associated with construction of hard engineering solutions. Ecosystem-based approaches (e.g. a targeted increase in tree cover in upper water catchments, spanning floodplains, or to create riparian buffers) would deliver mitigation co-benefits but are unlikely to be used.	Low
Condition of	*Identify, design and implement flood*	Other sectors will benefit from a reduction in flood risk within the area addressed by each	Medium	There may be a carbon cost associated with construction of hard	Low

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
cultural heritage	*management schemes for ecotourist attractions, where appropriate*	flood management scheme.		engineering solutions. Ecosystem-based approaches (e.g. a targeted increase in tree cover in upper water catchments, spanning floodplains, or to create riparian buffers) would deliver mitigation co-benefits but are unlikely to be used.	
Urban and infrastructure					
Urbanization	Promoting green buildings	Promoting green buildings will be of direct benefit to many sectors, e.g. health, water, industry etc.	Medium	Promoting green buildings could substantially reduce carbon emissions	Medium
Urbanization	*Rehabilitation of resilient road infrastructure*	Rehabilitation of the road infrastructure will directly benefit many sectors	Medium	There will be a carbon cost associated with construction of hard engineering solutions but this may be offset to some degree by reduction in vehicle emissions as a result of more efficient traffic flow.	Low
Waste and wastewater					
Waste	*Improve management*	Improved management of leachate would	Medium	Current management of landfill sites	Medium

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
management	*of leachate from landfill sites*	deliver benefits across a range of sectors, including: • Agriculture, as leachate from reverse osmosis can be used in irrigation • Health • Terrestrial ecosystems • Water		leads to substantial release of methane, a powerful greenhouse gas. Reverse osmosis uses a closed system that greatly reduces methane production.	
Waste management	*Improving waste collection system*	Improved waste collection would deliver benefits across a range of sectors, including agriculture, health, terrestrial ecosystems, and water.	Medium	Improved waste collection would reduce the likelihood of burning in situ and if combined with reverse osmosis would greatly reduce release of methane.	Medium
Waste management	*Reduce, re-use, recycle*	Co-benefits for adaptation in other sectors will be the same as for the other adaptation options for waste management, plus arising from a reduction in industrial waste	Medium	Co-benefits for mitigation will be the same as for the other adaptation options for waste management, plus arising from a reduction in industrial waste	High
Water					

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
Ground water supply	Enhance the use of additional and alternative water resources for non-domestic purposes	Direct benefits to agriculture and health sectors	High	None	Negative
Ground water supply	Allocate trans-boundary water resources equitably and reasonably between Israel and Palestine	Indirect benefits for all sectors	High	There may be a carbon cost associated with development of hard engineering solutions.	Low
Condition of infrastructure	Control of leakage from distribution systems	Direct benefits to agriculture and health sectors	Medium	There may be a carbon cost associated with development of hard engineering solutions.	Negative
Flood management	Develop and improve storm water systems and drainage infrastructure	Other sectors will benefit from a reduction in flood risk within that area addressed by the flood management scheme.	Medium	There may be a carbon cost associated with construction of hard engineering solutions. Ecosystem-based approaches (e.g. a targeted increase in tree cover in upper water catchments, spanning floodplains, or to create riparian buffers) would	Negative

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
				deliver mitigation co-benefits but are unlikely to be used.	
Gaza Strip					
Agriculture					
Irrigation water	*Improve water use efficiency and using alternatives water resources*	Would improve family income, promote sustainable water resources, and better human health	High	Carbon costs associated with installation and operation may be offset to some degree by increased soil organic matter and increased energy efficiency of the irrigation systems through reduced leakages and improved water productivity.	Low
Livestock production	*Improve livestock-production pens*	Increased food production, better human health. Improve family income.	Medium	Carbon costs will be associated with construction.	Negative
Cost of agricultural production	*Establishment of farmers' support (subsidies, awareness training programs)*	Increased food production and better human health.	Medium	No	Low
Cost of agricultural	*Agricultural disaster risk reduction and*	Ensuring food security and reducing volatility of local food access and prices (food sector).	Medium	Neutral	Low

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
production	*management (DRR/M)*	Reducing the impacts of climate change in the water sector.			
Citrus, Olive production, Vegetable production, Employment	*Climate-smart agriculture: Management of crop production systems including soil and water resources for better environmental sustainability along with improved economic profitability for farmers*	Increased food production, better human health, and increased water resources	High	Carbon costs associated with landscape management will be offset by increased soil organic matter, vegetation cover, and enhanced crop production.	High
Coastal and Marine					
Fishing/fisheries	*Enlargement of the fishing area and improve fishing equipment*	Would improve family income, food security and human health	Medium	No	Low
Fish catch	*Fish packaging/preservation industry*	Food, health and industry	Medium	GHG emission could result from the industry's activities	Negative

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
Coastal agriculture	*Introduction of new saline-tolerant crops*	Agriculture, food, health	High	Increasing the area of land with green vegetation cover could have a positive impact on GHG emissions.	Medium
Coastal agriculture	*Rain-water harvesting*	Agriculture, food, health	High	Increasing the area of land with green vegetation cover, as a result of water availability, could have a positive impact on GHG emissions.	High
Condition of beaches	*Provision of beach nourishment, reclamation and beach drift rehabilitation*	Agriculture, terrestrial ecosystems, urban and infrastructure, and tourism	High	GHG emissions will result from sand transportation for beach nourishment	Negative
Condition of beaches	*Construction of detached breakwaters*	Agriculture, terrestrial ecosystems, urban and infrastructure, and tourism	High	GHG emissions will result from construction activities	Negative
Condition of beaches	*Provision of laboratories and equipment for data collection and analysis*	All sectors listed as benefitting from adaptation options associated with the condition of beaches.	High	GHG emissions will result from construction activities	Negative
Energy					
Total domestic energy	*Enhancing the equipment and*	Increased security of energy supply will be beneficial to many sectors, e.g. Agriculture	High	Increasing equipment and facility efficiency would reduce GHG	Medium

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
production	*efficiency of the Gaza Power Plant (GPP)*	Industry, Water etc.		emissions per MW output production.	
Total energy imports	*Use of renewable energy, such as solar, to reduce imported energy.*	Increased security of energy supply will be beneficial to many sectors, e.g. industry, water, agriculture etc.	High	Using renewable energy whether for electricity or thermal applications would reduce GHG by replacing fossil fuels.	High
Condition of infrastructure	*Electricity grid upgrading*	Increased security of energy supply will be beneficial to many sectors, e.g. industry, water, agriculture etc.	High	Reducing electricity losses by upgrading the grid reduces the amount of energy generation required and thereby helps to reduce GHG emissions.	Medium
Total domestic energy production	*Implement energy efficiency measures to reduce consumption and hence imported energy*	Energy efficiency measures benefit all sectors by making more energy available and reducing costs. Hence, energy efficiency measures could be specifically implemented as an adaptation option in any sector.	Medium	Reducing energy consumption through energy efficiency would help to reduce GHG emissions.	High
Total energy imports	*Additional supply of energy from neighbouring countries*	Agriculture, energy, food	High	As any increase in energy supply from neighbouring countries may be offset by a reduction in energy generation by the industries	Low

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
				themselves, there may be little impact on net GHG emissions.	
Food					
Domestic food prices	*Enhancing agricultural value chain by improving infrastructure for livestock-production*	More abundant food at more affordable prices would directly and indirectly deliver benefits for many sectors, e.g. health, industry, etc.	High	There will be carbon costs associated with improving infrastructure for livestock-production pens and their maintenance but they will be offset, at least to some degree, by a reduction in food imports and associated emissions.	Negative
Domestic food prices	*Greenhouse management*	More abundant food at more affordable prices would directly and indirectly deliver benefits for many sectors, e.g. health, industry, etc.	Medium	There will be carbon costs associated with erection of greenhouses and their maintenance but they will be offset, at least to some degree, by a reduction in food imports and associated emissions.	Negative
Domestic food prices	*Construction large-scale cold storage*	More abundant food at more affordable prices would directly and indirectly deliver benefits for many sectors, e.g. health, industry, etc.	Medium	There are likely to be carbon costs associated with construction and operation.	Negative

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
Imported food prices	*Construct large-scale steel silos for grain to enable import and storage during periods when prices on the international markets are low*	More abundant food at more affordable prices would directly and indirectly deliver benefits for many sectors, e.g. health, industry, etc.	Medium	There are likely to be carbon costs associated with construction and operation.	Negative
Gender					
Major diseases related to water and sanitation	Increasing the awareness of people, particularly women, in water-poor areas of measures they can take to help prevent major diseases related to water, sanitation, and food	Increasing the awareness of people, especially women, of the potential impact and measures that they can take to prevent it will directly benefit a number of sectors (e.g. health, water, and food) and deliver indirect benefits more widely (e.g. to industry).	High	Measures taken by people as a result of the awareness campaigns might deliver some carbon benefits (e.g. in relation to domestic waste management)	Low
Employment and gender	Supporting improvements in efficient use of water in	Would promote sustainable use of water resources	Medium	Carbon costs associated with installation and operation may be offset to some degree by increased	Low

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
	women's private small-scale agricultural projects			soil organic matter.	
Food security and gender	Encouraging women to use their house gardens to produce food	Encouraging women to use their house gardens to produce food would directly benefit the food and health sectors.	Medium	Measures taken by women as a result of the awareness campaigns might deliver some carbon benefits.	Low
Health					
Major diseases related to water, sanitation, and food	*Development of water, food and sanitation monitoring and safety systems using high technology*	Development of water monitoring and safety systems using high technology will also directly benefit the water and agriculture sectors.	High	No	Low
Major diseases related to water, sanitation, and food	*Training health professionals and increasing the awareness of people, particularly women, in water-poor areas about measures they can take to help prevent major*	Training health professionals and increasing the awareness of people, especially women, about the potential impact and measures that they can take to prevent it will directly benefit a number of sectors (e.g. health, water, and food) and deliver indirect benefits more widely (e.g. to industry).	Medium	Measures taken by people as a result of the awareness campaigns might deliver some carbon benefits (e.g. in relation to domestic waste management)	Medium

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
	diseases related to water, sanitation, and food				
Industry					
Value of industrial products exported	*Provision of suitable storage facilities for industrial products intended for export*	Agriculture, food	Medium	Construction of storage facilities will lead to GHG emissions.	Negative
Value of raw materials exported	*Improve handling, fumigation, packaging, and storage techniques for raw materials intended for export*	Agriculture, food.	Medium	Better handling, fumigation, packaging, and storage techniques could reduce GHG emissions, e.g. methane from waste.	Low
Employment	*Capacity building to enable industries to adapt to climate change*	All sectors	High	Adaptation measures may increase GHG emissions (e.g. where they lead to increased construction or transportation) or reduce emissions (e.g. where they result in less waste)	Low
Value of	*Rehabilitation of*	Agriculture, food, urban and infrastructure.	High	Construction associated with	Medium

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
industrial products exported	*industrial facilities*			rehabilitation is likely to lead to GHG emissions but the new facilities are likely to emit less GHG.	
Energy supply	*Providing reliable electricity supply*	Energy	Medium	Use of private electricity generators will increase GHG emissions.	Negative
Energy demand	*Conducting energy audits in order to increase industries' use of energy efficiency measures*	Energy	Medium	This adaptation would lead to increased energy efficiency and a reduction in GHG emissions	Medium
Energy demand	*Rehabilitation and maintenance of industrial equipment*	Energy	Medium	Better maintenance of equipment would reduce GHG emissions.	Medium
Terrestrial Ecosystems					
Habitat connectivity in Wadi Gaza	*National network of protected areas, including 3 protected areas and 3 biodiversity hotspots*	Establishing a national network of protected areas will maintain and restore the delivery of a wide range of ecosystem services across sectors. For example: • Agriculture/food - maintaining pollination,	High	Establishing a national network of protected areas will increase carbon sequestration and storage associated with land use land-use change and forestry (LULUCF), as a result of soil	High

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
		soil fertility/protection • Energy - wood fuel (29% of Palestine's energy comes from firewood) • Health - encouraging mental well-being • Tourism - landscape aesthetics and ecotourism • Urban and infrastructure - Sustainable Urban Drainage Systems (SUDS), urban cooling, green infrastructure • Water - maintaining ground water and surface water quality and quantity, reducing and delaying flood flows		protection, maintenance of vegetation cover and increased tree cover	
Urban and Infrastructure					
Building conditions	Promoting green buildings	Promoting green buildings will be of direct benefit to many sectors, e.g. health, water, industry etc.	Medium	Promoting green buildings could substantially reduce carbon emissions	Medium
Urbanization	*Rehabilitation of resilient road*	Rehabilitation of the road infrastructure will directly benefit many sectors	Medium	There will be a carbon cost associated with construction of hard	Low

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
	infrastructure			engineering solutions but this may be offset to some degree by reduction in vehicle emissions as a result of more efficient traffic flow.	
Waste and wastewater					
Waste management	*Improve management of leachate from landfill sites*	Improved management of leachate would deliver benefits across a range of sectors/themes, including: • Agriculture, as leachate from reverse osmosis can be used in irrigation • Health • Terrestrial ecosystems • Water	Medium	Current management of landfill sites leads to substantial release of methane, a powerful greenhouse gas. Reverse osmosis uses a closed system that greatly reduces methane production.	Medium
Waste management	*Improving waste collection system*	Improved waste collection would deliver benefits across arange of sectors/themes, including agriculture, health, terrestrial ecosystems, and water.	Medium	Improved waste collection would reduce the likelihood of burning in situ and if combined with reverse osmosis would greatly reduce release of methane.	Medium

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
Waste management	*Reduce, re-use, recycle*	Co-benefits for adaptation in other sectors will be the same as for the other adaptation options for waste management, plus arising from a reduction in industrial waste	Medium	Cobenefits for mitigation will be the same as for the other adaptation options for waste management, plus arising from a reduction in industrial waste	High
Water					
Groundwater supply	*Enhance the use of alternative water resources for non-domestic purposes*	Direct benefits to agriculture and health sectors	High	There may be a carbon cost associated with development of hard engineering solutions.	Low
Groundwater quality and supply	*Build a large desalination plant for Gaza*	Direct benefits to agriculture and health sectors	High	There will be a carbon cost associated with development of the desalination plant.	Negative
Flood management	*Develop and improve stormwater systems and drainage infrastucture*	Other sectors will benefit from a reduction in flood risk within that area addressed by the flood management scheme.	Medium	There may be a carbon cost associated with construction of hard engineering solutions. Ecosystem-based approaches (e.g. a targeted increase in tree cover in upper water catchments, spanning foodplains, or to create riparian buffers) would	Negative

Highly vulnerable sector	Adaptation option	Co-benefits for adaptation in other sectors	Score	Co-benefits for mitigation	Score
				deliver mitigation cobenefits but are unlikely to be used.	
Groundwater supply	*Increase share of imported water*	Direct benefits to agriculture and health sectors	High	There may be carbon costs associated with installation of piping that may be offset to some degree by a decrease in GHG emissions arising from reductions in use of water desalination units and drinking water treatment plants.	Low