




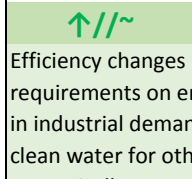
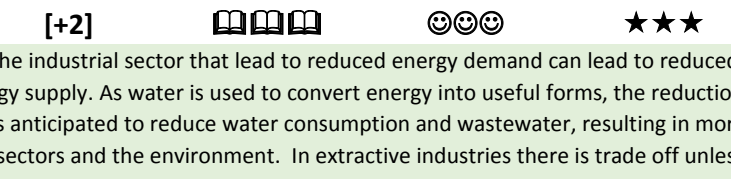
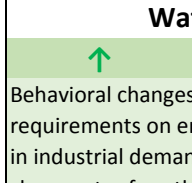
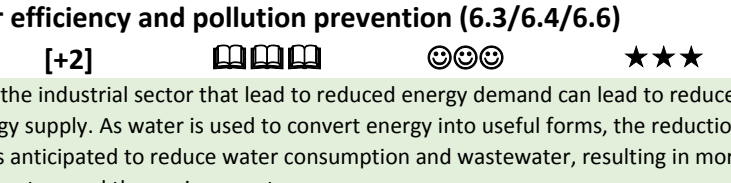
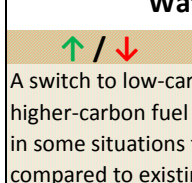
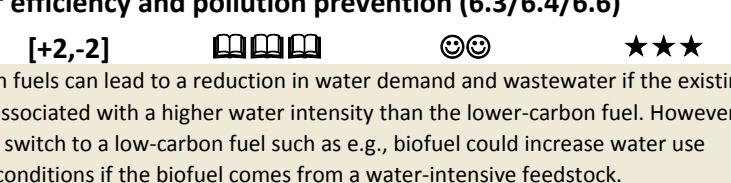
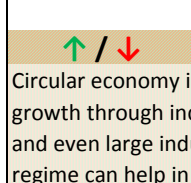
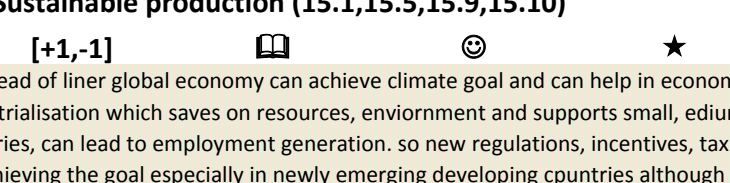
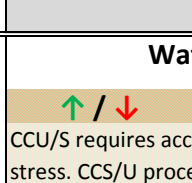
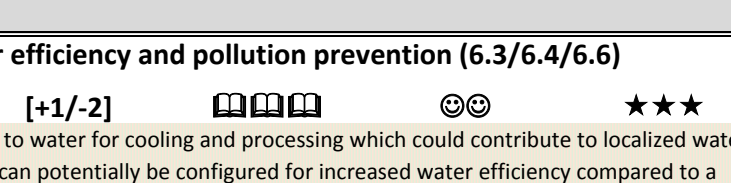
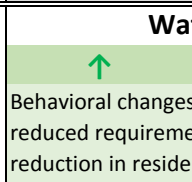
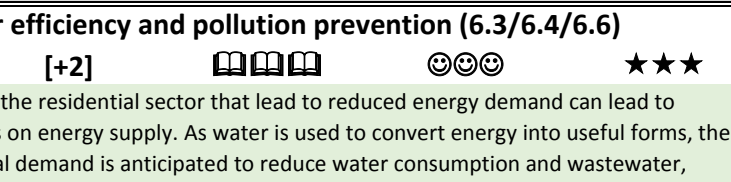
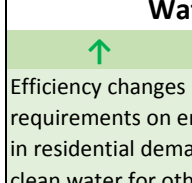
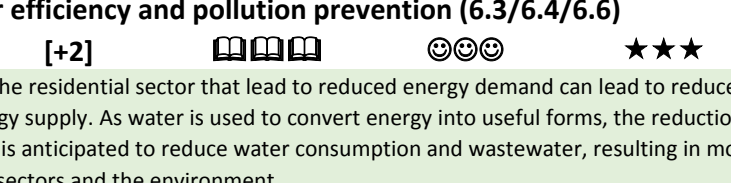
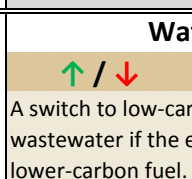
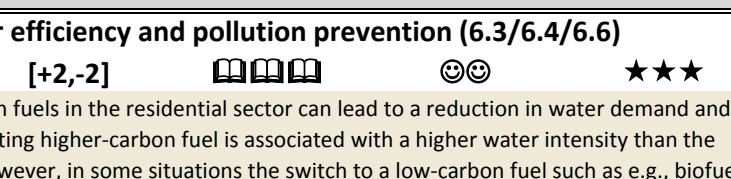
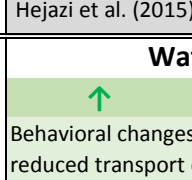
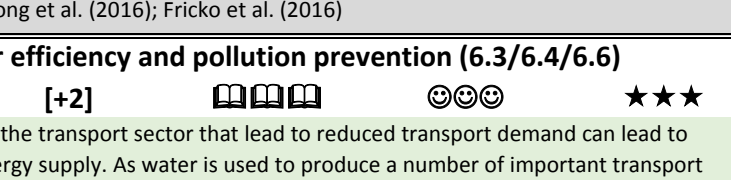

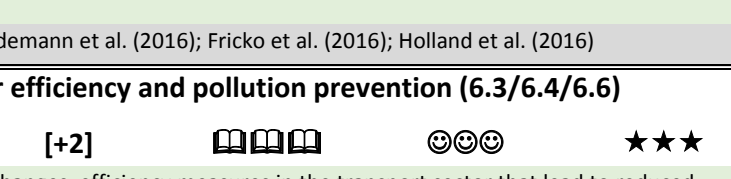
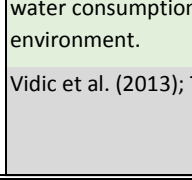
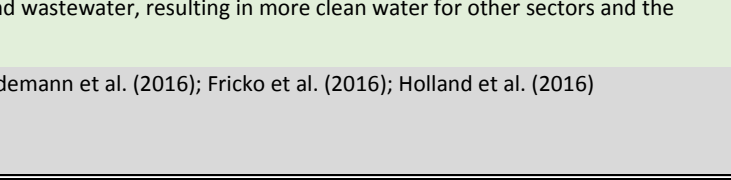
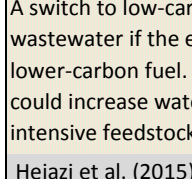
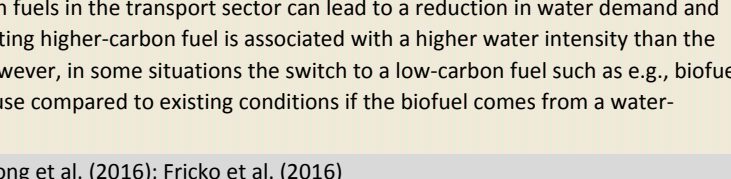


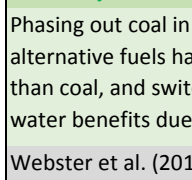
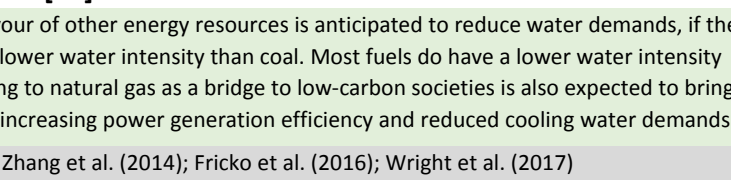
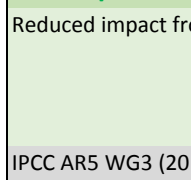
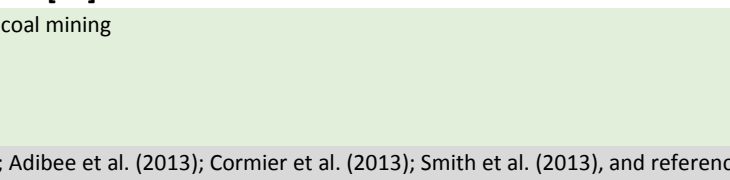
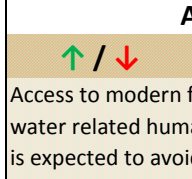
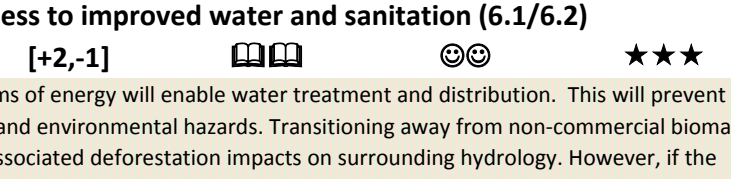


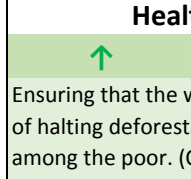
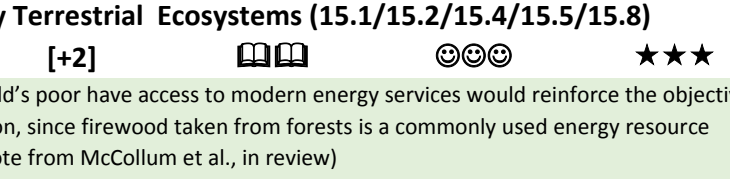
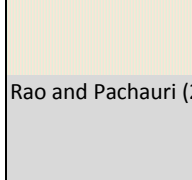
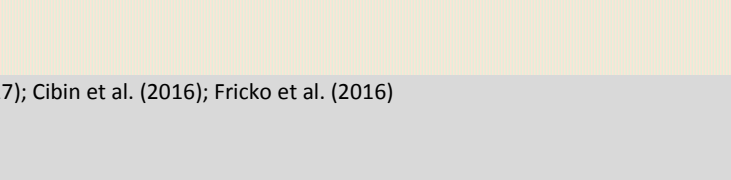
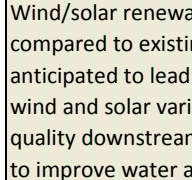
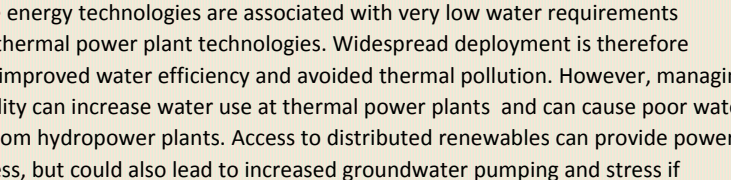
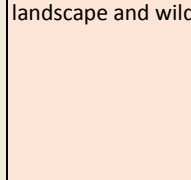

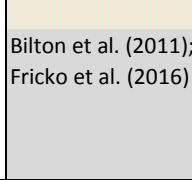
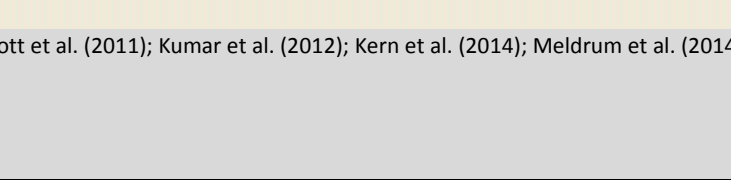
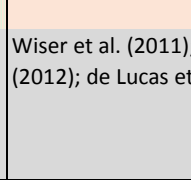
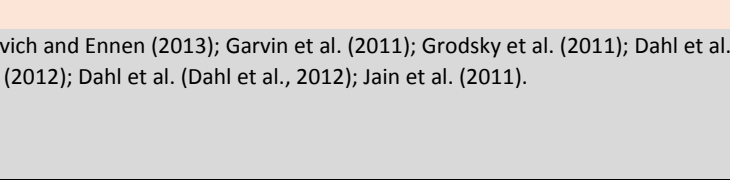
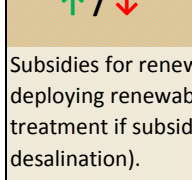
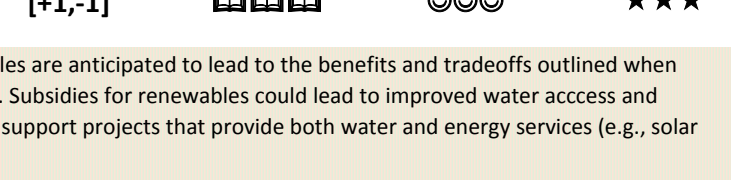
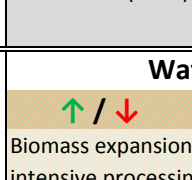
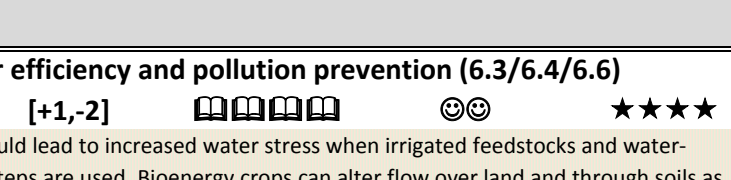
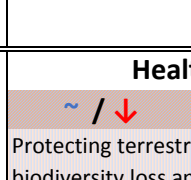
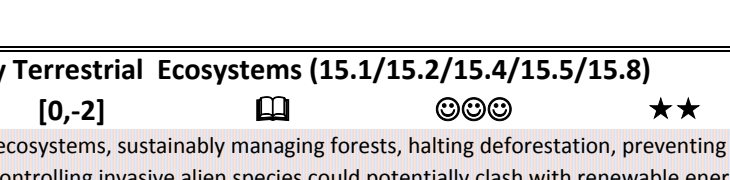
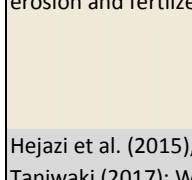
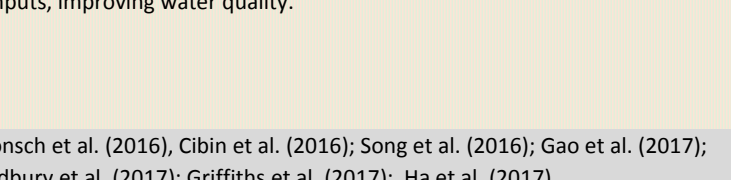


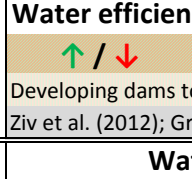
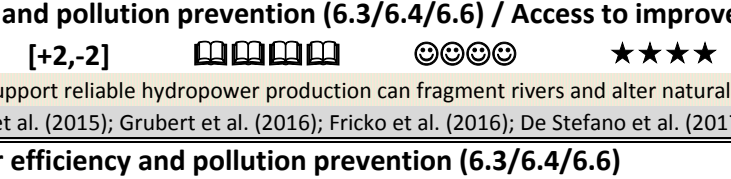
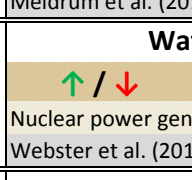
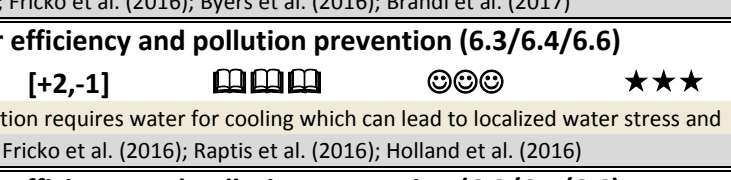
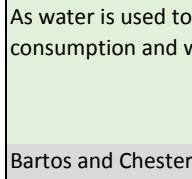
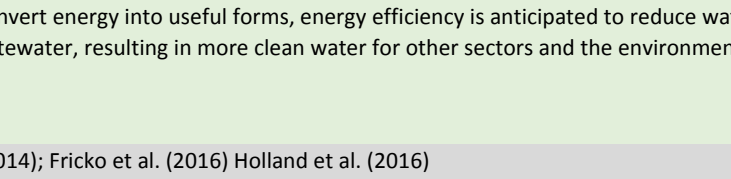
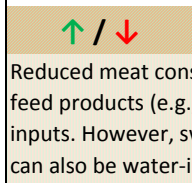
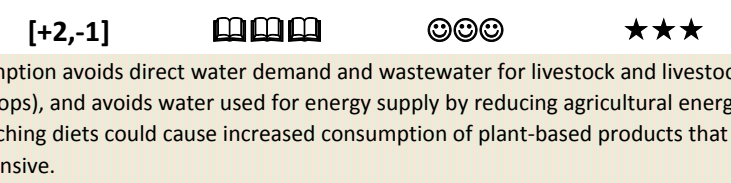
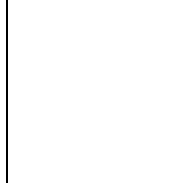

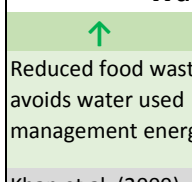
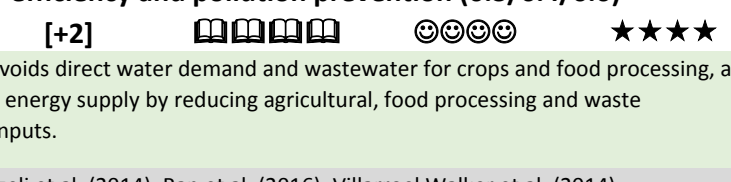
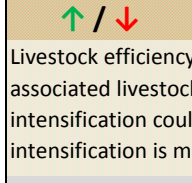
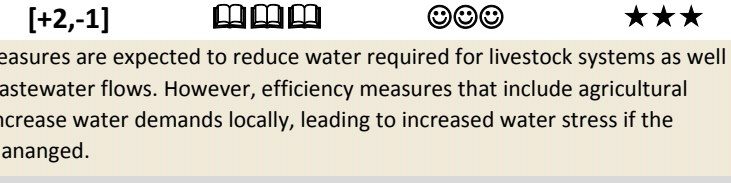
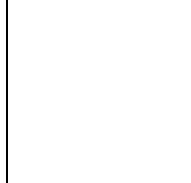

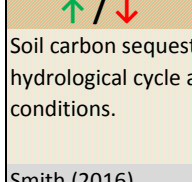
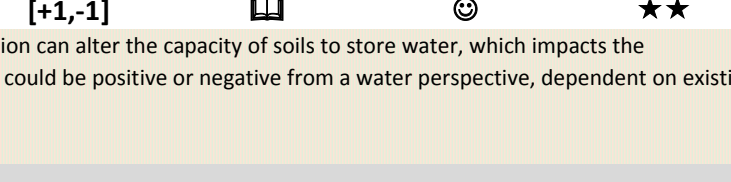
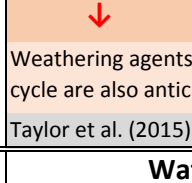
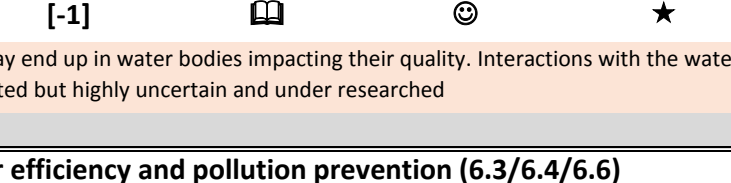
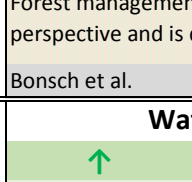
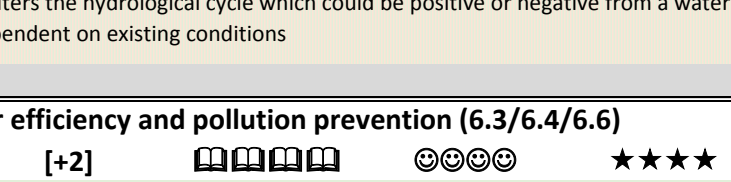
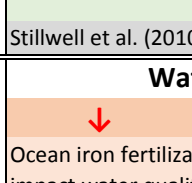
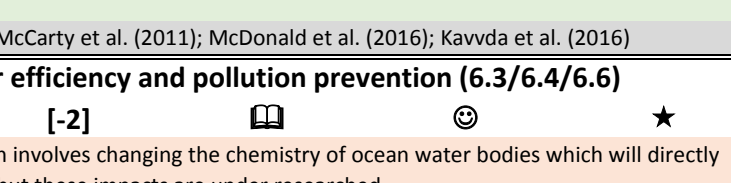
Table 5.1 a. Social Dimension

Sector	Interaction	Nelson Score	Evidence	Literature Assessment	Confidence	Interaction	Nelson Score	Evidence	Literature Assessment	Confidence	Interaction	Nelson Score	Evidence	Literature Assessment	Confidence	Interaction	Nelson Score	Evidence	Literature Assessment	Confidence	Interaction	Nelson Score	Evidence	Literature Assessment	Confidence
Industry demand	Efficiency reduction	↑	[+2]	○○○	○	↑	[+1]	○○○	○○○	★★	↑	[+1]	○○○	○○○	★★	↑	[+1]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Industry fuel decarbonization and cross sector collaboration	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Residential demand reduction	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Transport demand reduction	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Transport fuel decarbonization	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Phasing out coal supply side	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Improving Access to Modern Energy	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Deployment of Renewables	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Subsidies for Renewables Energy Sources	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Increased use of biomass	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Large scale hydro	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Deployment of CCS in the power sector	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Nuclear energy	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Improving energy efficiency	Switch to low carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
AFOLD demand-side measures & consumption	Reduced food waste	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
AFOLD supply-side measures	Increased efficiency	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Non-CO2 mitigation measures	Methane removal	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Oceans/Water	Ocean iron fertilization	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Oceans/Water	Blue Carbon	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★
Oceans/Water	Enhanced Weathering, ocean	↑	[+2]	○○○	○	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★	↑	[+2]	○○○	○○○	★★

Table 5.1b. Economic Dimension

		7 ECONOMIC DIMENSION					8 ECONOMIC DIMENSION					9 ECONOMIC DIMENSION					11 ECONOMIC DIMENSION					12 ECONOMIC DIMENSION				
		INTERACTION	NILSSON SCORE	EVIDENCE	LITERATURE AGREEMENT	CONFIDENCE	INTERACTION	NILSSON SCORE	EVIDENCE	LITERATURE AGREEMENT	CONFIDENCE	INTERACTION	NILSSON SCORE	EVIDENCE	LITERATURE AGREEMENT	CONFIDENCE	INTERACTION	NILSSON SCORE	EVIDENCE	LITERATURE AGREEMENT	CONFIDENCE	INTERACTION	NILSSON SCORE	EVIDENCE	LITERATURE AGREEMENT	CONFIDENCE
Industry demand reduction	Efficiency	Energy savings ↑ +2 ☐☐☐☐ ☐☐☐☐ *** Energy efficiency leads to reduced demand and hence energy supply and energy security. Positive rebound effect can raise demand but to a very lesser extent due to low rebound effect in industry sector and also help in supplying surplus energy to cities. Zhang et al. (2015), PCC WGIII (2014), Chakravarty et al. (2013), Kaner et al. (2015)					Reduces Unemployment ↑ +2 ☐☐☐☐ ☐☐☐☐ *** Unemployment rate reduction from 25% to 12% Akter et al. (2016)					Sustainable cities (15.6,15.8,15.9) ↑ +2 ☐☐☐☐ ☐☐☐☐ *** Industries are becoming supplier of energy, waste heat, water, roof tops for solar energy generation and supply to neighbouring human settlements and hence reduced primary energy demand also and make towns and cities grow sustainably Kaner et al. (2015)														
	Behaviour																									
Industry fuel decarbonization and cross sector collaboration	Switch to low-carbon	Economic growth with decent employment (8.1,8.2,8.3,8.4) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ **** Circular economy instead of linear global economy can achieve climate goal and can help in economic growth through industrialisation which saves on resources, environment and supports small, medium and even large industries, can lead to employment generation, so new regulations, incentives, tax regime can help in achieving the goal. Supino et al. (2015), Fan et al. (2017), Leder et al. (2015), Zheng et al. (2016), Shi et al. (2017), Liu et al. (2014), Stahel (2017)					Innovation and new infrastructure (9.2,9.3,9.4,9.5,9.6) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ **** Circular economy instead of linear global economy can achieve climate goal and can help in economic growth through industrialisation which saves on resources, environment and supports small, medium and even large industries, can lead to employment generation, so new regulations, incentives, tax regime can help in achieving the goal. Supino et al. (2015), Fan et al. (2017), Leder et al. (2015), Zheng et al. (2016), Shi et al. (2017), Liu et al. (2014), Stahel (2017)					Sustainable production (12.3, 12.3, 12.4,12.5, 12.9,12.11) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ **** Circular economy instead of linear global economy can achieve climate goal and can help in economic growth through industrialisation which saves on resources, environment and supports small, medium and even large industries, can lead to employment generation, so new regulations, incentives, tax regime can help in achieving the goal especially in newly emerging developing countries although applicable for large industrialised countries also. Supino et al. (2015), Fan et al. (2017), Leder et al. (2015), Zheng et al. (2016), Shi et al. (2017), Liu et al. (2014), Stahel (2017)														
	CCS/CCU																									
Residential demand reduction	behaviour	energy savings behaviour and lifestyle change ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Lifestyle change measures and adoption behavior affect residential energy use and implementation of efficient technologies in residential HVAC systems. Also social influence can drive energy savings in users exposed to energy consumption feedback. Effect of autonomous motivation on energy saving behaviour is greater than that of other more established predictors such as intention, subjective norms, perceived behavioural control and past behaviour. Use of a hybrid engineering approach using social psychology and economic behaviour models are suggested for residential peak electricity demand response. Yan, Yang, and Chen (2015), Somayaji, Ryan, and Viner (2017), Zhou et al. (2017), de Koning et al. (2016), Iqbal and Fang (2016), Slavov et al. (2016), Noonen et al. (2015), Allen et al. (2015), Jain et al. (2013), Hor et al. (2013), Sweeney et al. (2013), Webb et al. (2013), Hubner et al. (2013), Gopal, Prasad, and Ghosh (2013)					Sustainable economic growth and employment ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Efficient cookstoves lead to local employment generation. Bernuete et al. (2017)										Responsible and sustainable consumption ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Technological improvements alone are not sufficient to increase energy savings. Zhao et al. (2017) findings indicate that building technology and occupant behaviors interact with each other and finally affect energy consumption from home. They found that occupant habits could not take advantage of more than 50 percent of energy efficiency potential allowed by an efficient building. In the electronic payment product obsolescence represents a key challenge for sustainability. (Chengyuan (2015) discusses the dissonance between consumer product durability experience, orientations to replace devices before terminal technical failure, and perceptions of industry responsibility and performance. Zhao et al. (2017), Schaeffer, Ryan, and Viner (2017), Iqbal and Fang (2016), Ho, Wang, and Lu (2016), Hult and Larsson (2016), Slavov et al. (2016), Allen et al. (2015), Sweeney et al. (2013), Webb et al. (2013)									
	efficiency	Increase in energy savings ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** There is high agreement among researchers based on large number of evidence across various countries that energy efficiency improvement reduce energy consumption and hence lead to energy savings. Efficient cookstoves saves bioenergy. Efficient cookstoves saves bioenergy. Bernuete et al. (2017), Cameron, Taylor, and Emmett (2015), Lidwell and Guiney (2015), McLeod, Hogg, and Kwan (2013), Nani et al. (2013), Sakai et al. (2017), Yang, Yin, and Lam (2014), Kwang, Adams, and Sabari (2014), Holmstrom et al. (2014)					Sustainable economic growth and employment ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Efficient cookstoves lead to local employment generation. Bernuete et al. (2017)																			
Residential fuel decarbonization	Switch to low-carbon	Meeting energy demand ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Renewable energies could potentially serve as the main source of meeting energy demand in the rapidly growing developing country cities. Ali et al. (2015) estimated the potential of solar, wind and biomass renewable energy options to meet part of the electrical demand in Karachi, Pakistan. Czuczaj et al. (2014), Connolly et al. (2014), Isler et al. (2017), Mittelbach, (2016), Biljly et al. (2017), Orlan et al. (2017), Mahay and Dufour (2015), Bernuete et al. (2017), Akbari et al. (2016), Wang and Lu (2013), Pietscher, (2013), Ali et al. (2015), Li, Yang, and Lam (2013), Yamine and Sauma (2013), Pohl (2012), Zala and Michelson (2013)					Sustainable economic growth and employment ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Czuczaj et al. (2014) assessed the potential for renewable energy in the European region. They found that a European energy transition with a high-level of renewable energy installations in the periphery could act as an economic stimulus, decrease trade deficits, and possibly have positive employment effects. Czuczaj et al. (2014), Bjervan et al. (2017), et al. (2015)																			
	behaviour	Promote Sustained, inclusive economic growth (8.3) ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Policy contradictions (e.g. standards, efficient technologies leading to increased electricity prices leading the poor to switch away from cleaner fuels), unintended outcomes (e.g. redistribution of income generated by carbon taxes) results in contradiction to the primary aims of (productive) job creation and poverty alleviation, and a trade-off between mitigation adaptation and development periods. Detailed assessment of consequences of mitigation policies requires developing methods and reliable evidence to enable policymakers to more systematically identify how different social groups may be affected by the different available policy options. Knowlton, Anegón, Heneman, & Ruhl (2016), Lucas & Png (2014), Duvall, Tompkins, & Stringer (2016)					Promote Sustained, inclusive economic growth (8.3) ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Significant opportunities to slow travel growth and improve efficiency exist and, similarly, alternatives to petroleum exist but have different characteristics in terms of availability, cost, distribution, infrastructure, storage, and public acceptability. Production of new technologies, fuels and infrastructure can foster economic growth, however, efficient financing of increased capital spending and infrastructure is critical. Goodson et al. (2015), (Karkatouli, Sikiri, Panousis, & Capros, 2016)					Build Resilient Infrastructure (9.1) ↑ / ↓ +2, -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Combining promotion of mass transportation, integrating train lines, a tram line, BRTs, gondola lift systems, a bicycle-sharing systems and hybrid buses and telecommuting, reduce traffic and significantly contribute to meet climate targets. A comprehensive package of complementary mitigation policies is necessary for deep and sustained emission reductions. (Dobu, 2018)(Amas & Peters, 2017), (Martinez Jaramillo, Arango-Andres, Alvarez Uribe, & Jarambo-Arango, 2017)					Make cities & Human settlements inclusive, safe, resilient (11.2) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Climate change threatens to worsen poverty, therefore pro-poor mitigation policies are needed to reduce this threat. For example, investing more in infrastructure by leveraging private resources and using designs that account for future climate change and the related uncertainty (Hallegatte et al., 2015)					Ensure Sustainable Consumption & Production patterns (12.3) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Urban carbon mitigation must consider the supply chain management of imported goods, the production efficiency within the city, the consumption patterns of urban consumers, and the responsibility of the ultimate consumers outside the city. Important for climate policy of monitoring the CO2 clusters that dominate CO2 emissions in global supply chains because they offer insights on where climate policy can be effectively directed. (Lin, Hu, Gu, Kang, & Kanamitsu, 2015), (Kang et al., 2015)				
efficiency	Promote Sustained, inclusive economic growth (8.3) ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Significant opportunities to slow travel growth and improve efficiency exist and, similarly, alternatives to petroleum exist but have different characteristics in terms of availability, cost, distribution, infrastructure, storage, and public acceptability. Production of new technologies, fuels and infrastructure can foster economic growth, however, efficient financing of increased capital spending and infrastructure is critical. Goodson et al. (2015), (Karkatouli, Sikiri, Panousis, & Capros, 2016)					Build Resilient Infrastructure (9.1) ↑ / ↓ +2, -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Combining promotion of mass transportation, integrating train lines, a tram line, BRTs, gondola lift systems, a bicycle-sharing systems and hybrid buses and telecommuting, reduce traffic and significantly contribute to meet climate targets. A comprehensive package of complementary mitigation policies is necessary for deep and sustained emission reductions. (Dobu, 2018)(Amas & Peters, 2017), (Martinez Jaramillo, Arango-Andres, Alvarez Uribe, & Jarambo-Arango, 2017)					Make cities & Human settlements inclusive, safe, resilient (11.2) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Climate change threatens to worsen poverty, therefore pro-poor mitigation policies are needed to reduce this threat. For example, investing more in infrastructure by leveraging private resources and using designs that account for future climate change and the related uncertainty (Hallegatte et al., 2015)					Sustainable Consumption (12.3/12.8) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Rational complex transport behavior resulting in significant growth in energy inefficient car choices, as well as differences in mobility patterns (distances driven, driving styles) and actual fuel consumption between different car segments all affect the non-progress on transport decarbonisation. Consumption choices, and individual practices are situated tied to the form of the surrounding urbanization. Major behavioural changes and emissions reductions requires (Gibney, Reuber, & Luder, 2012)(Hemmes, Jahn, Justen, Abu-Monir, & Junnila, 2013), (Gibney, Monero, & Sato, 2013), (Kamari & Peters, 2017)(Gössling & Meyer, 2017), (Reverdo & Smit, 2017)										
Transport demand reduction	behaviour	Promote Sustained, inclusive economic growth (8.3) ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Policy contradictions (e.g. standards, efficient technologies leading to increased electricity prices leading the poor to switch away from cleaner fuels), unintended outcomes (e.g. redistribution of income generated by carbon taxes) results in contradiction to the primary aims of (productive) job creation and poverty alleviation, and a trade-off between mitigation adaptation and development periods. Detailed assessment of consequences of mitigation policies requires developing methods and reliable evidence to enable policymakers to more systematically identify how different social groups may be affected by the different available policy options. Knowlton, Anegón, Heneman, & Ruhl (2016), Lucas & Png (2014), Duvall, Tompkins, & Stringer (2016)					Promote Sustained, inclusive economic growth (8.3) ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Significant opportunities to slow travel growth and improve efficiency exist and, similarly, alternatives to petroleum exist but have different characteristics in terms of availability, cost, distribution, infrastructure, storage, and public acceptability. Production of new technologies, fuels and infrastructure can foster economic growth, however, efficient financing of increased capital spending and infrastructure is critical. Goodson et al. (2015), (Karkatouli, Sikiri, Panousis, & Capros, 2016)					Build Resilient Infrastructure (9.1) ↑ / ↓ +2, -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Combining promotion of mass transportation, integrating train lines, a tram line, BRTs, gondola lift systems, a bicycle-sharing systems and hybrid buses and telecommuting, reduce traffic and significantly contribute to meet climate targets. A comprehensive package of complementary mitigation policies is necessary for deep and sustained emission reductions. (Dobu, 2018)(Amas & Peters, 2017), (Martinez Jaramillo, Arango-Andres, Alvarez Uribe, & Jarambo-Arango, 2017)					Make cities & Human settlements inclusive, safe, resilient (11.2) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Climate change threatens to worsen poverty, therefore pro-poor mitigation policies are needed to reduce this threat. For example, investing more in infrastructure by leveraging private resources and using designs that account for future climate change and the related uncertainty (Hallegatte et al., 2015)					Ensure Sustainable Consumption & Production patterns (12.3) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Urban carbon mitigation must consider the supply chain management of imported goods, the production efficiency within the city, the consumption patterns of urban consumers, and the responsibility of the ultimate consumers outside the city. Important for climate policy of monitoring the CO2 clusters that dominate CO2 emissions in global supply chains because they offer insights on where climate policy can be effectively directed. (Lin, Hu, Gu, Kang, & Kanamitsu, 2015), (Kang et al., 2015)				
	efficiency	Promote Sustained, inclusive economic growth (8.3) ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Significant opportunities to slow travel growth and improve efficiency exist and, similarly, alternatives to petroleum exist but have different characteristics in terms of availability, cost, distribution, infrastructure, storage, and public acceptability. Production of new technologies, fuels and infrastructure can foster economic growth, however, efficient financing of increased capital spending and infrastructure is critical. Goodson et al. (2015), (Karkatouli, Sikiri, Panousis, & Capros, 2016)					Build Resilient Infrastructure (9.1) ↑ / ↓ +2, -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Combining promotion of mass transportation, integrating train lines, a tram line, BRTs, gondola lift systems, a bicycle-sharing systems and hybrid buses and telecommuting, reduce traffic and significantly contribute to meet climate targets. A comprehensive package of complementary mitigation policies is necessary for deep and sustained emission reductions. (Dobu, 2018)(Amas & Peters, 2017), (Martinez Jaramillo, Arango-Andres, Alvarez Uribe, & Jarambo-Arango, 2017)					Make cities & Human settlements inclusive, safe, resilient (11.2) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Climate change threatens to worsen poverty, therefore pro-poor mitigation policies are needed to reduce this threat. For example, investing more in infrastructure by leveraging private resources and using designs that account for future climate change and the related uncertainty (Hallegatte et al., 2015)					Sustainable Consumption (12.3/12.8) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Rational complex transport behavior resulting in significant growth in energy inefficient car choices, as well as differences in mobility patterns (distances driven, driving styles) and actual fuel consumption between different car segments all affect the non-progress on transport decarbonisation. Consumption choices, and individual practices are situated tied to the form of the surrounding urbanization. Major behavioural changes and emissions reductions requires (Gibney, Reuber, & Luder, 2012)(Hemmes, Jahn, Justen, Abu-Monir, & Junnila, 2013), (Gibney, Monero, & Sato, 2013), (Kamari & Peters, 2017)(Gössling & Meyer, 2017), (Reverdo & Smit, 2017)									
Transport fuel decarbonization	Switch to low-carbon	Increase share of renewable (7.2) ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Broader increase share of renewables can be performed poorly by too many countries increase their use of biomass, whereas electrification performs best when many other countries implement this use of biomass. The strategies are not mutually exclusive and simultaneous implementation of some provides synergies for national energy security. Therefore, important to consider result of material and contextual factors that co-evolve. (Manson, 2016)					Promote Sustained, inclusive economic growth (8.3) ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** The decarbonisation of the freight sector tends to occur in the second part of the century and that the sector decarbonises by a lower extent than the rest of the economy. Decarbonising road freight on a global scale remains a challenge even when notable progress in biofuels and electric vehicles has been accounted for. (Carraa & Longden, 2016), (F. Czuczaj et al., 2015)(PCC AR5 WG3 (2014)					Build Resilient Infrastructure (9.1) ↑ / ↓ +2, -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Combining promotion of mass transportation, integrating train lines, a tram line, BRTs, gondola lift systems, a bicycle-sharing systems and hybrid buses and telecommuting, reduce traffic and significantly contribute to meet climate targets. A comprehensive package of complementary mitigation policies is necessary for deep and sustained emission reductions. (Dobu, 2018)(Amas & Peters, 2017), (Martinez Jaramillo, Arango-Andres, Alvarez Uribe, & Jarambo-Arango, 2017)					Make cities & Human settlements inclusive, safe, resilient (11.2) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Climate change threatens to worsen poverty, therefore pro-poor mitigation policies are needed to reduce this threat. For example, investing more in infrastructure by leveraging private resources and using designs that account for future climate change and the related uncertainty (Hallegatte et al., 2015)					Ensure Sustainable Consumption & Production patterns (12.3) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Urban carbon mitigation must consider the supply chain management of imported goods, the production efficiency within the city, the consumption patterns of urban consumers, and the responsibility of the ultimate consumers outside the city. Important for climate policy of monitoring the CO2 clusters that dominate CO2 emissions in global supply chains because they offer insights on where climate policy can be effectively directed. (Lin, Hu, Gu, Kang, & Kanamitsu, 2015), (Kang et al., 2015)				
	Phasing out coal supply-side, upstream-sector impacts	Promote Sustained, inclusive economic growth (8.3) ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** The decarbonisation of the freight sector tends to occur in the second part of the century and that the sector decarbonises by a lower extent than the rest of the economy. Decarbonising road freight on a global scale remains a challenge even when notable progress in biofuels and electric vehicles has been accounted for. (Carraa & Longden, 2016), (F. Czuczaj et al., 2015)(PCC AR5 WG3 (2014)					Build Resilient Infrastructure (9.1) ↑ / ↓ +2, -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Combining promotion of mass transportation, integrating train lines, a tram line, BRTs, gondola lift systems, a bicycle-sharing systems and hybrid buses and telecommuting, reduce traffic and significantly contribute to meet climate targets. A comprehensive package of complementary mitigation policies is necessary for deep and sustained emission reductions. (Dobu, 2018)(Amas & Peters, 2017), (Martinez Jaramillo, Arango-Andres, Alvarez Uribe, & Jarambo-Arango, 2017)					Make cities & Human settlements inclusive, safe, resilient (11.2) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Climate change threatens to worsen poverty, therefore pro-poor mitigation policies are needed to reduce this threat. For example, investing more in infrastructure by leveraging private resources and using designs that account for future climate change and the related uncertainty (Hallegatte et al., 2015)					Ensure Sustainable Consumption & Production patterns (12.3) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Urban carbon mitigation must consider the supply chain management of imported goods, the production efficiency within the city, the consumption patterns of urban consumers, and the responsibility of the ultimate consumers outside the city. Important for climate policy of monitoring the CO2 clusters that dominate CO2 emissions in global supply chains because they offer insights on where climate policy can be effectively directed. (Lin, Hu, Gu, Kang, & Kanamitsu, 2015), (Kang et al., 2015)									
Improving Access to Modern Energy modern biomass, nuclear, other renewables (solar, wind, etc.)		Employment Opportunities (8.2/8.3/8.5/8.6) ↑ +1 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Provision of energy access can play a critical enabling role for new productive activities, livelihoods and employment. Reliable access to modern energy services can have an important influence on productivity and earnings. (Quote from McCollum et al., in review) McCollum et al. (in review), Bernard and Terezo (2015), Chakravarty et al. (2014), Gragan and bedmond (2013), Puroy et al. (2013), Rao (2013).					Build Resilient Infrastructure (9.1) ↑ / ↓ +2, -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Combining promotion of mass transportation, integrating train lines, a tram line, BRTs, gondola lift systems, a bicycle-sharing systems and hybrid buses and telecommuting, reduce traffic and significantly contribute to meet climate targets. A comprehensive package of complementary mitigation policies is necessary for deep and sustained emission reductions. (Dobu, 2018)(Amas & Peters, 2017), (Martinez Jaramillo, Arango-Andres, Alvarez Uribe, & Jarambo-Arango, 2017)					Housing and Transport (11.1/11.2) ↑ +3 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ **** Ensuring access to basic housing services implies that households have access to modern energy forms. (Quote from McCollum et al., in review) McCollum et al. (in review), Bhattacharya et al. (2016), UN (2016)														
	Deployment of Renewables modern biomass, other renewables (solar, wind, etc.)	Innovation and Growth (16.1/16.2/16.4) 0 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Decarbonization of the energy system through an up-scaling of renewables and energy efficiency consistent with sustained economic growth and resource recycling. Long term scenarios point towards high consumption losses caused by a rapid and pervasive expansion of such energy solutions. Whether sustainable growth investing in such sustainable or not is more disputed in the literature. Existing literature is also undecided as to whether or not access to modern energy services causes economic growth. (Quote from McCollum et al., in review) McCollum et al. (in review), Roman et al. (2014), Clarke et al. (2014), Jackson and Senker (2011), New Climate Economy (2014), OECD (2017), York and McGee (2017)					Inclusive and Sustainable Industrialization (9.2/9.4) ↓ -1 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** A rapid up-scaling of renewable energies could necessitate the early retirement of fossil energy infrastructure (e.g. power plants, refineries, pipelines) on a large scale. The implications of this could in some cases be negative, unless targeted policies can help alleviate the burden on industry. (Quote from McCollum et al., in review) McCollum et al. (in review), Bertam et al. (2015), Fankhauser et al. (2008), Guivarch et al. (2011), Johnson et al. (2015)					Disaster Preparedness and Prevention (11.5) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Deployment of renewable energy and improvements in energy efficiency globally will aid climate change mitigation efforts, and this, in turn, can help to reduce the exposure of people to certain types of disasters and extreme events. (Quote from McCollum et al., in review) McCollum et al. (in review), O'Neil et al. (2013), Hallegatte et al. (2016), PCC (2014), Rishi et al. (2012), Tully (2006)					Natural Resource Protection (12.2/12.3/12.4/12.5) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ **** Renewable energy and energy efficiency slow the depletion of several types of natural resources, namely coal, oil, natural gas, and uranium. In addition, the phasing out of fossil fuel subsidies encourages less wasteful energy consumption, but if that is done, then the policies implemented must take care to minimize any countervailing adverse side-effects on the poor (e.g., fuel price rises). (Quote from McCollum et al., in review) McCollum et al. (in review), Banerjee et al. (2012), Bhattacharya et al. (2016), Cameron et al. (2016), Hahn et al. (2012), Schwartz et al. (2014)									
Subsidies for Renewable Energy Sources this category collects impacts that are specific to funding instruments for renewable energy sources		Employment Opportunities (8.2/8.3/8.5/8.6) / Strong Financial Institutions ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Deploying renewables and energy-efficient technologies, when combined with other targeted monetary and fiscal policies, can help spur innovation and reinforce local, regional, and national industrial and employment objectives. Gross employment effects seem likely to be positive, however, uncertainty remains regarding the net employment effects due to several uncertainties surrounding macro-economic feedback loops playing out at the global level. Moreover, the distributional effects experienced by individual actors may vary significantly. Strategic measures may need to be taken to ensure that a large-scale switch to renewable energy minimizes any negative impacts on those currently engaged in the business of fossil fuels (e.g., government support could help businesses re-tool and workers re-train). To support clean energy and energy efficiency efforts, strengthened financial institutions in developing country communities are necessary for providing capital, credit, and insurance to local entrepreneurs attempting to enact change. (Quote from McCollum et al., in review) McCollum et al. (in review), Anther (2016), Babiker and Ekuru (2007), Bertam et al. (2015), Blyth et al. (2014), Borenstein (2012), Czuczaj et al. (2015), Clarke et al. (2014), Dechezleppre and Sato (2014), Dhawan (2011), Fankhauser et al. (2008), Ferraro et al. (2016), Fontrodé et al. (2010), Gohil (2006), Gowami et al. (2011), Jackson and Senker (2011), Johnson et al. (2015)					Infrastructure renewal (9.1/9.3/9.5) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Financial and technical support can play a critical role in promoting the development of the renewable energy industry and more energy-efficient infrastructure. This includes targeted policy incentives (e.g., subsidies) and spending on scientific research to encourage technological innovation. (Quote from McCollum et al., in review) McCollum et al. (in review), Bhattacharya et al. (2016), Golubov (2014), Metzner (2016), Rishi et al. (2012)					Urban Environmental Sustainability (11.3/11.6) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ **** Renewable energy technologies and energy-efficient urban infrastructure solutions (e.g., public transit) can also promote urban environmental sustainability by improving air quality and reducing noise. Efficient transportation technologies powered by renewable-based energy carriers will be a building block of any sustainable transport system. (Quote from McCollum et al., in review) McCollum et al. (in review), Bongardt et al. (2013), Czuczaj et al. (2012), Grubler and Fisk (2012), Kahn Ribeiro et al. (2012), Raj et al. (2013), Rishi et al. (2012)					Sustainable Practices and Lifestyles (12.6/12.7/12.8) ↑ +1 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ **** Sustainable practices adopted by public and private bodies in their operations (e.g., for goods procurement, supply chain management, and accounting) create an enabling environment in which renewable energy and energy efficiency measures may gain greater traction. (Quote from McCollum et al., in review) McCollum et al. (in review), COP (2015), European Climate Foundation (2014), Khan et al. (2015), New Climate Economy (2015), Stefan and Paul (2008)									
	Increased use of biomass	Employment Opportunities (8.2/8.3/8.5/8.6) / Strong Financial Institutions ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Deploying renewables and energy-efficient technologies, when combined with other targeted monetary and fiscal policies, can help spur innovation and reinforce local, regional, and national industrial and employment objectives. Gross employment effects seem likely to be positive, however, uncertainty remains regarding the net employment effects due to several uncertainties surrounding macro-economic feedback loops playing out at the global level. Moreover, the distributional effects experienced by individual actors may vary significantly. Strategic measures may need to be taken to ensure that a large-scale switch to renewable energy minimizes any negative impacts on those currently engaged in the business of fossil fuels (e.g., government support could help businesses re-tool and workers re-train). To support clean energy and energy efficiency efforts, strengthened financial institutions in developing country communities are necessary for providing capital, credit, and insurance to local entrepreneurs attempting to enact change. (Quote from McCollum et al., in review) McCollum et al. (in review), Anther (2016), Babiker and Ekuru (2007), Bertam et al. (2015), Blyth et al. (2014), Borenstein (2012), Czuczaj et al. (2015), Clarke et al. (2014), Dechezleppre and Sato (2014), Dhawan (2011), Fankhauser et al. (2008), Ferraro et al. (2016), Fontrodé et al. (2010), Gohil (2006), Gowami et al. (2011), Jackson and Senker (2011), Johnson et al. (2015)					Infrastructure renewal (9.1/9.3/9.5) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ *** Financial and technical support can play a critical role in promoting the development of the renewable energy industry and more energy-efficient infrastructure. This includes targeted policy incentives (e.g., subsidies) and spending on scientific research to encourage technological innovation. (Quote from McCollum et al., in review) McCollum et al. (in review), Bhattacharya et al. (2016), Golubov (2014), Metzner (2016), Rishi et al. (2012)					Urban Environmental Sustainability (11.3/11.6) ↑ +2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ **** Renewable energy technologies and energy-efficient urban infrastructure solutions (e.g., public transit) can also promote urban environmental sustainability by improving air quality and reducing noise. Efficient transportation technologies powered by renewable-based energy carriers will be a building block of any sustainable transport system. (Quote from McCollum et al., in review) McCollum et al. (in review), Bongardt et al. (2013), Czuczaj et al. (2012), Grubler and Fisk (2012), Kahn Ribeiro et al. (2012), Raj et al. (2013), Rishi et al. (2012)					Sustainable Practices and Lifestyles (12.6/12.7/12.8) ↑ +1 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ **** Sustainable practices adopted by public and private bodies in their operations (e.g., for goods procurement, supply chain management, and accounting) create an enabling environment in which renewable energy and energy efficiency measures may gain greater traction. (Quote from McCollum et al., in review) McCollum et al. (in review), COP (2015), European Climate Foundation (2014), Khan et al. (2015), New Climate Economy (2015), Stefan and Paul (2008)									
Large-scale hydro		Employment Opportunities (8.2/8.3/8.5/8.6) / Strong Financial Institutions ↓ -2 ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ** Deploying renewables and energy-efficient technologies, when combined with other targeted monetary and fiscal policies, can help spur innovation and reinforce local, regional, and national industrial and employment objectives. Gross employment effects seem likely to be positive, however, uncertainty remains regarding the net employment effects due to several																								

Table 5.1 c. Environment Dimension

		6  Water					14  Oceans					15  Life on Land				
		INTERACTION	NILSSON SCORE	EVIDENCE	LITERATURE AGREEMENT	CONFIDENCE	INTERACTION	NILSSON SCORE	EVIDENCE	LITERATURE AGREEMENT	CONFIDENCE	INTERACTION	NILSSON SCORE	EVIDENCE	LITERATURE AGREEMENT	CONFIDENCE
Industry demand reduction	Efficiency	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2]  *** Efficiency changes in the industrial sector that lead to reduced energy demand can lead to reduced requirements on energy supply. As water is used to convert energy into useful forms, the reduction in industrial demand is anticipated to reduce water consumption and wastewater, resulting in more clean water for other sectors and the environment. In extractive industries there is trade off unless Vassilo and Doell (2015); Fricko et al. (2016); Holland et al. (2016); Nguyen et al. (2016)														
	Behaviour	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2]  *** Behavioral changes in the industrial sector that lead to reduced energy demand can lead to reduced requirements on energy supply. As water is used to convert energy into useful forms, the reduction in industrial demand is anticipated to reduce water consumption and wastewater, resulting in more clean water for other sectors and the environment. Vassilo and Doell														
Industry fuel decarbonization and cross sector collaboration	Switch to low-carbon	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2,-]  *** A switch to low-carbon fuels can lead to a reduction in water demand and wastewater if the existing higher-carbon fuel is associated with a higher water intensity than the lower-carbon fuel. However, in some situations the switch to a low-carbon fuel such as e.g., biofuel could increase water use compared to existing conditions if the biofuel comes from a water-intensive feedstock. Hejazi et al. (2015); Song et al. (2016); Fricko et al. (2016)										Sustainable production (15.1,15.5,15.9,15.10)  [-1,-]  * Circular economy instead of linear global economy can achieve climate goal and can help in economic growth through industrialisation which saves on resources, environment and supports small, medium and even large industries, can lead to employment generation, so new regulations, incentives, tax regimes can help in achieving the goal especially in newly emerging developing countries although applicable for large industrialised countries also. Shi et al (2017)				
	CCU/CC	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+1,-2]  *** CCU/CC requires access to water for cooling and processing which could contribute to localized water stress. CCU/CC process can potentially be configured for increased water efficiency compared to a system without carbon capture via process integration. Meldrum et al. (2013); Fricko et al. (2016); Byers et al. (2016); Brandt et al. (2017)														
Residential demand reduction	behavior	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2]  *** Behavioral changes in the residential sector that lead to reduced energy demand can lead to reduced requirements on energy supply. As water is used to convert energy into useful forms, the reduction in residential demand is anticipated to reduce water consumption and wastewater, resulting in more clean water for other sectors and the environment. Bartos and Chester (2014); Fricko et al. (2016); Holland et al. (2016)														
	efficiency	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2]  *** Efficiency changes in the residential sector that lead to reduced energy demand can lead to reduced requirements on energy supply. As water is used to convert energy into useful forms, the reduction in residential demand is anticipated to reduce water consumption and wastewater, resulting in more clean water for other sectors and the environment. Hendrickson et al. (2014); Bartos and Chester (2014); Fricko et al. (2016); Holland et al. (2016)														
Residential fuel decarbonization	Switch to low-carbon	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2,-]  *** A switch to low-carbon fuels in the residential sector can lead to a reduction in water demand and wastewater if the existing higher-carbon fuel is associated with a higher water intensity than the lower-carbon fuel. However, in some situations the switch to a low-carbon fuel such as e.g., biofuel could increase water use compared to existing conditions if the biofuel comes from a water-intensive feedstock. Hejazi et al. (2015); Song et al. (2016); Fricko et al. (2016)														
Transport demand reduction	behavior	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2]  *** Behavioral changes in the transport sector that lead to reduced transport demand can lead to reduced transport energy supply. As water is used to produce a number of important transport fuels, the reduction in transport demand is anticipated to reduce water consumption and wastewater, resulting in more clean water for other sectors and the environment. Vidic et al. (2013); Tiedemann et al. (2016); Fricko et al. (2016); Holland et al. (2016)														
	efficiency	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2]  *** Similar to behavioral changes, efficiency measures in the transport sector that lead to reduced transport demand can lead to reduced transport energy supply. As water is used to produce a number of important transport fuels, the reduction in transport demand is anticipated to reduce water consumption and wastewater, resulting in more clean water for other sectors and the environment. Vidic et al. (2013); Tiedemann et al. (2016); Fricko et al. (2016); Holland et al. (2016)														
Transport fuel decarbonization	Switch to low-carbon	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2,-]  *** A switch to low-carbon fuels in the transport sector can lead to a reduction in water demand and wastewater if the existing higher-carbon fuel is associated with a higher water intensity than the lower-carbon fuel. However, in some situations the switch to a low-carbon fuel such as e.g., biofuel could increase water use compared to existing conditions if the biofuel comes from a water-intensive feedstock. Hejazi et al. (2015); Song et al. (2016); Fricko et al. (2016)														
Phasing out coal	supply-side, upstream-sector impacts	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2]  *** Phasing out coal in favour of other energy resources is anticipated to reduce water demands. If the alternative fuels have lower water intensity than coal. Most fuels do have a lower water intensity than coal, and switching to natural gas as a bridge to low-carbon societies is also expected to bring water benefits due to increasing power generation efficiency and reduced cooling water demands. Webster et al. (2013); Zhang et al. (2014); Fricko et al. (2016); Wright et al. (2017)										Healthy Terrestrial Ecosystems (15.1/15.2/15.4/15.5/15.8)  [+1]  *** Reduced impact from coal mining				
Improving Access to Modern Energy	modern biomass, nuclear, other renewables (solar, wind, etc.)	Access to improved water and sanitation (6.1/6.2)  [+2,-]  *** Access to modern forms of energy will enable water treatment and distribution. This will prevent water related human and environmental hazards. Transitioning away from non-commercial biomass is expected to avoid associated deforestation impacts on surrounding hydrology. However, if the transition to modern forms of energy results in the development of water-intensive energy resources, improved energy access could lead to increased water stress. Rao and Pachauri (2017); Cbin et al. (2016); Fricko et al. (2016)										Healthy Terrestrial Ecosystems (15.1/15.2/15.4/15.5/15.8)  [+2]  *** Ensuring that the world's poor have access to modern energy services would reinforce the objective of halting deforestation, since firewood taken from forests is a commonly used energy resource among the poor. (Quote from McCallum et al., in review)				
Deployment of Renewables	modern biomass, other renewables (solar, wind, etc.)	Water efficiency and pollution prevention (6.3/6.4/6.6) / Access to improved  [+2,-]  *** Wind/solar renewable energy technologies are associated with very low water requirements compared to existing thermal power plant technologies. Widespread deployment is therefore anticipated to lead to improved water efficiency and avoided thermal pollution. However, managing wind and solar variability can increase water use at thermal power plants and can cause poor water quality downstream from hydropower plants. Access to distributed renewables can provide power to improve water access, but could also lead to increased groundwater pumping and stress if mismanaged. Bilton et al. (2011); Scott et al. (2011); Kumar et al. (2012); Kern et al. (2014); Meldrum et al. (2014); Fricko et al. (2016)					Marine Economies (14.7) / Marine Protection (14.7/14.2/14.4/14.5)  [1,-1]  ** Ocean-based energy from renewable sources (e.g., offshore wind farms, wave and tidal power) are potentially significant energy resource bases for island countries and countries situated along coastlines. Multi-use platforms combining renewable energy generation, aquaculture, transport services and leisure activities can lay the groundwork for more diversified marine economies. Depending on the local context and prevailing regulations, ocean-based energy installations could either reduce spatial competition with other marine activities, such as tourism, shipping, resources exploitation, and marine and coastal habitats and protected areas, or provide further grounds for protecting those exact habitats, therefore enabling marine protection. (Quote from McCallum et al., in review)					Healthy Terrestrial Ecosystems (15.1/15.2/15.4/15.5/15.8)  [-1]  ** Landscape and wildlife impact for wind				
Subsidies for Renewables Energy Sources	this category collects impacts that are specific to funding instruments for renewable energy sources	Water efficiency and pollution prevention (6.3/6.4/6.6) / Access to improved  [+1,-1]  *** Subsidies for renewables are anticipated to lead to the benefits and tradeoffs outlined when deploying renewables. Subsidies for renewables could lead to improved water access and treatment if subsidies support projects that provide both water and energy services (e.g., water desalination). Bilton et al. (2011); Scott et al. (2011); Kumar et al. (2012); Kern et al. (2014); Meldrum et al. (2014); Fricko et al. (2016)														
Increased use of biomass		Water efficiency and pollution prevention (6.3/6.4/6.6)  [+1,-2]  *** Biomass expansion could lead to increased water stress when irrigated feedstocks and water-intensive processing steps are used. Bioenergy crops can alter flow over land and through soils as well as require fertilizer and this can reduce water availability and quality. Planting bioenergy crops on marginal lands or in some situations to replace existing crops can lead to reductions in soil erosion and fertilizer inputs, improving water quality. Hejazi et al. (2015); Bensch et al. (2016); Cbin et al. (2016); Song et al. (2016); Gao et al. (2017); Tanwaji (2017); Woodbury et al. (2017); Griffiths et al. (2017); Ha et al. (2017)										Healthy Terrestrial Ecosystems (15.1/15.2/15.4/15.5/15.8)  [0,-2]  ** Protecting terrestrial ecosystems, sustainably managing forests, halting deforestation, preventing biodiversity loss and controlling invasive alien species could potentially clash with renewable energy expansion, if that would mean constraining large-scale utilization of bioenergy or hydropower. Good governance, cross-jurisdictional coordination, and sound implementation practices are critical for minimizing trade-offs. (Quote from McCallum et al., in review)				
Large-scale hydro		Water efficiency and pollution prevention (6.3/6.4/6.6) / Access to improved  [+2,-]  *** Developing dams to support reliable hydropower production can fragment rivers and alter natural flow regimes. Ziv et al. (2012); Grill et al. (2015); Grubert et al. (2016); Fricko et al. (2016); De Stefano et al. (2017)										Healthy Terrestrial Ecosystems (15.1/15.2/15.4/15.5/15.8)  [-1]  ** Habitat impact				
Deployment of CCS in the power sector	either with fossil fuels or bioenergy (BECCS)	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+1,-2]  *** CCU/CS requires access to water for cooling and processing which could contribute to localized water stress. Meldrum et al. (2013); Fricko et al. (2016); Byers et al. (2016); Brandt et al. (2017)														
Nuclear energy		Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2,-1]  *** Nuclear power generation requires water for cooling which can lead to localized water stress and Webster et al. (2013); Fricko et al. (2016); Raptis et al. (2016); Holland et al. (2016)										Healthy Terrestrial Ecosystems (15.1/15.2/15.4/15.5/15.8)  [-1]  ** Safety and waste concerns, uranium mining and milling				
Improving energy efficiency	general demand-side measures (where they cannot be specifically attributed to one sector)	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2]  *** As water is used to convert energy into useful forms, energy efficiency is anticipated to reduce water consumption and wastewater, resulting in more clean water for other sectors and the environment. Bartos and Chester (2014); Fricko et al. (2016); Holland et al. (2016)					Ocean Acidification (14.3)  [+2]  *** Deployment of renewable energy and improvements in energy efficiency globally can reduce carbon dioxide emissions, and this, in turn, will slow rates of ocean acidification. (Quote from McCallum et al., in review)									
AFOLU demand-side measures & dietary change	Reduced meat consumption	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2,-1]  *** Reduced meat consumption avoids direct water demand and wastewater for livestock and livestock feed products (e.g., crops), and avoids water used for energy supply by reducing agricultural energy inputs. However, switching diets could cause increased consumption of plant-based products that can also be water-intensive. Khan et al. (2009); Mekonnen et al. (2013); Bajorek et al. (2014); Khan et al. (2016)														
	Reduced food waste	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2]  *** Reduced food waste avoids direct water demand and wastewater for crops and food processing, and avoids water used for energy supply by reducing agricultural, food processing and waste management energy inputs. Khan et al. (2009); Bajorek et al. (2014); Khan et al. (2016); Villanovi Water et al. (2014)														
AFOLU supply-side measures	Increased efficiency of livestock systems	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2,-1]  *** Livestock efficiency measures are expected to reduce water required for livestock systems as well as associated livestock wastewater flow. However, efficiency measures that include agricultural intensification could increase water demands locally, leading to increased water stress if the intensification is mismanaged. Mekonnen et al. (2013); King et al. (2016); Khan et al. (2016)														
	Climate smart agriculture and Soil carbon sequestration	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+1,-1]  ** Soil carbon sequestration can alter the capacity of soils to store water, which impacts the hydrological cycle and could be positive or negative from a water perspective, dependent on existing conditions. Smith (2016)										Conservation of Biodiversity (15.5/15.9)  [+1,-1]  *** Agricultural intensification can promote conservation of biological diversity by reducing deforestation, and by rehabilitation and restoration of biodiverse communities on previously developed farms or pasture lands. However, planting monocultures on biodiversity hot spots can have adverse side-effects, reducing biodiversity				
	Enhanced Weathering, terrestrial	Water efficiency and pollution prevention (6.3/6.4/6.6)  [-1]  * Weathering agents may end up in water bodies impacting their quality. Interactions with the water cycle are also anticipated but highly uncertain and under researched. Taylor et al. (2015)														
	Forestry, Forest management, REDD+	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+1,-1]  ** Forest management alters the hydrological cycle which could be positive or negative from a water perspective and is dependent on existing conditions. Bensch et al.										Conservation of Biodiversity (15.2/15.3/15.4/15.5/15.9)  [+1]  *** Policies and programs for reducing deforestation and forest degradation, for rehabilitation and restoration of degraded lands can promote conservation of biological diversity				
Non-CO2 mitigation measures	Methane removal	Water efficiency and pollution prevention (6.3/6.4/6.6)  [+2]  *** Methane removal from wastewater can be used to generate low-carbon energy. This energy can be used to offset increasing water treatment energy demands to ensure water quality objectives. Sillwell et al. (2010); McCarthy et al. (2011); McDonald et al. (2014); Kavada et al. (2016)														
Oceans/Water	Ocean iron fertilization	Water efficiency and pollution prevention (6.3/6.4/6.6)  [-2]  * Ocean iron fertilization involves changing the chemistry of ocean water bodies which will directly impact water quality, but these impacts are under researched. Keelker et al. (2013)														
	Blue carbon	Integrated water resources management (6.3/6.5)  [+2]  * Development of blue carbon resources (coastal and marine vegetated ecosystems) can lead to coordinated management of water in coastal areas. Verros et al. (2013)														
	Enhanced Weathering, ocean	Water efficiency and pollution prevention (6.3/6.4/6.6)  [-1]  * Weathering agents are expected to impact water quality. Interactions with the water cycle are also anticipated but highly uncertain and under researched. Taylor et al. (2015)														

Legend for Table 5.1

Table 5.1 shows Synergies (↑) and Tradeoffs (↓) and undecided (↔) relation between sectoral mitigation options and sustainable development dimensions as well as SDGs. Synergies and tradeoffs or even undecided outcome of various mitigation options on SDGs arise due to multiple factors and nature of relation also vary. Brief description of those are given in following three tables based on assessment of the literature. Set of literature used so far based on current search are mentioned as well. Table 5.1a shows Social dimensions of SD along with relevant SDGs. Table 5.1b shows Economic dimensions of SD along with relevant SDGs. Table 5.1c shows Economic dimensions of SD along with relevant SDGs. We use various symbols for evidence (📖), agreement (😊), confidence (★) and we use various strengths for each of these using following legends. Since variety of interactions among SDGs are possible following explanations from Nilsson et al. 2016 are used to indicate a score [] for showing interactions among SDGs.

Interaction score (Nilsson et al. 2016)			LITERATURE AGREEMENT	EVIDENCE	CONFIDENCE
+3	Indivisible	Inextricably linked to the achievement of another goal.	very high	very robust	very high
+2	Reinforcing	Aids the achievement of another goal.	😊😊😊😊	📖📖📖 📖	★★★★
+1	Enabling	Creates conditions that further another goal.	😊😊😊	📖📖📖	★★★
0	Consistent	No significant positive or negative interactions.			
-1	Constraining	Limits options on another goal.	😊😊	📖📖	★★
-2	Counteracting	Clashes with another goal.			
-3	Cancelling	Makes it impossible to reach another goal.	😊	📖	★

References used in this assessment: Impacts of mitigation options on specific targets of the 17 SDGs, for social dimensions (Table 5.1a):

Altieri et al. 2016b; Casillas and Kammen 2012; Scott et al. 2014; Maidment et al. 2014; Berrueta et al. 2017b; Hallegatte et al. 2015; Suckall et al. 2014b; McCollum et al.; Bonan et al. 2014; Burlig and Preonas 2016; Casillas and Kammen 2010; Cook 2011; Kirubi et al. 2009; Pachauri et al. 2012; Pueyo et al. 2013; Hallegatte et al. 2016b; Riahi et al. 2012; Cameron et al. 2016; Fay et al. 2015; Hirth and Ueckerdt 2013; Jakob et al. 2014; IPCC 2014c; Havlík et al. 2015; Luttrell et al. 2013; Ravikumar et al. 2015; Di Gregorio et al. 2017b; Ickowitz et al. 2017; Loft et al. 2017; Asaduzzaman et al. 2010; Cabraal et al. 2005; Finco and Doppler 2010; Hasegawa et al. 2015; Lotze-Campen et al. 2014; Msangi et al. 2010; Smith et al. 2013; Sola et al. 2016; Tilman et al. 2009; van Vuuren et al. 2009; Balishter and Singh 1991; Creutzig et al. 2013; de Moraes et al. 2010; Gohin 2008; Rud 2012; Satolo and Bacchi 2013; van der Horst and Vermeulen 2011; Corbera and Pascual 2012; Davis et al. 2013; Muys et al. 2014; Xi et al. 2013; Zhang et al. 2015; Huebner et al. 2013; Yue et al. 2013a; Zhao et al. 2017; Willand et al. 2015; Wells et al. 2015; Cameron et al. 2015; Liddell and Guiney 2015; Sharpe et al. 2015; Derbez et al. 2014; Creutzig et al. 2012; Haines and Dora 2012; Saunders et al. 2013; Shaw et al. 2014b; Woodcock et al. 2009; Schucht et al. 2015; Figueroa et al. 2014; Peng et al. 2017; Klausbruckner et al. 2016; Koornneef et al. 2011; Singh et al. 2011; Hertwich et al. 2008; Veltman et al. 2010; Corsten et al. 2013; Ashworth et al. 2012; Einsiedel et al. 2013; Miller et al. 2007; de Best-Waldhober et al. 2009; Wong-Parodi and Ray 2009; Reiner and Nuttall 2011; Burgherr et al. 2012; Chen et al. 2012; Chan and Griffiths 2010; Asfaw et al. 2013; Aranda et al. 2014; Lam et al. 2012; Lim et al. 2012; Anenberg et al. 2013; Chaturvedi and Shukla 2014; Haines et al. 2007; IEA 2016; Kaygusuz 2011; Nemet et al. 2010; Rafaj et al. 2013; Rao et al. 2013a; Smith and Sagar 2014; van Vliet et al. 2012; West et al. 2013; Atchley et al. 2013; Apps et al. 2010; Siirila et al. 2012; Wang and Jaffe 2004; Cardis et al. 2006; Abdelouas 2006; Al-Zoughool and Krewski 2009; Schnelzer et al. 2010; Tirmarche et al. 2012; Brugge D. & Buchner 2011; Hiyama et al. 2013; Mousseau and Møller 2013; Møller and Mousseau 2011; Møller et al. 2012, 2011; von Stechow et al. 2016; Heinävaara et al. 2010; Kaatsch et al. 2008; Sermage-Faure et al. 2012; Lipscomb et al. 2013; van de Walle et al. 2013; Chowdhury 2010; Haves 2012; Matinga 2012; Pachauri and Rao 2013; Clancy et al. 2011; Dinkelman 2011; Köhlin et al. 2011; Brown 2011; Lucas and Pangbourne 2014; Cass et al. 2010; Cumbers 2012; Kunze and Becker 2015; Walker and Devine-Wright 2008; Jakob and Steckel 2014; Cayla and Osso 2013; Hult and Larsson 2016; Aggarwal 2013; AlSabbagh et al. 2017; Acemoglu 2009; ICSU and ISSC 2015; Tabellini 2010; Clarke et al. 2009; Eis et al. 2016; Montreal Protocol 1989; New Climate Economy 2015; O'Neill et al. 2017b; Ramaker et al. 2003; Riahi et al. 2015, 2017

References used in this assessment: Impacts of mitigation options on specific targets of the 17 SDGs, for economic dimensions (Table 5.1b):

Zhang et al. 2015; IPCC 2014c; Chakravarty and Tavoni 2013; Karner et al. 2015; Yue et al. 2013b; Zhao et al. 2017; de Koning et al. 2016; Isenhour and Feng 2016; van Sluisveld et al. 2016; Noonan et al. 2015; Allen et al. 2015; Jain et al. 2013; Hori et al. 2013; Sweeney et al. 2013; Webb et al. 2013; Huebner et al. 2013; Gyamfi et al. 2013; Berrueta et al. 2017b; Cameron et al. 2015; Liddell and Guiney 2015; McLeod et al. 2013; Noris et al. 2013; Salvalai et al. 2017; Yang et al. 2014; Kwong et al. 2014; Holopainen et al. 2014; Creutzig et al. 2014; Ali et al. 2015; Månsson 2016; Altieri et al. 2016b; Fan et al. 2017; Shi et al. 2017; Klausbruckner et al. 2016; Lucas and Pangbourne 2014; Suckall et al. 2014b; Gouldson et al. 2015; Carrara and Longden 2016; Bernard and Torero 2015; Chakravorty et al. 2014; Grogan and Sadanand 2013; Pueyo et al. 2013; Rao et al. 2013b; Bonan et al. 2014; Clarke et al. 2014; Jackson and Senker 2011; New Climate Economy 2014; OECD 2017; York and McGee 2017; McCollum et al.; Babiker and Eckaus 2007; Bertram et al. 2015; Blyth et al. 2014; Borenstein 2012; Creutzig et al. 2013; Dechezleprêtre and Sato 2014; Dinkelman 2011; Ferroukhi et al. 2016; Frondel et al. 2010; Gohin 2008; Guivarch et al. 2011; Johnson et al. 2015; He et al. 2016; Lin et al. 2015; Kagawa et al. 2015; Heinonen et al. 2013; Gallego et al. 2013; Aamaas and Peters 2017; Gössling and Metzler 2017; Figueroa et al. 2014; Banerjee et al. 2012; Bhattacharyya et al. 2016; Cameron et al. 2016; Riahi et al. 2012; Schwanitz et al. 2014; European Climate Foundation 2014; Khan et al. 2015; New Climate Economy 2015; Stefan and Paul 2008; Hallegatte et al. 2015; Figueroa et al. 2013; Daut et al. 2013; Tully 2006; Bongardt et al. 2013; Creutzig et al. 2012; Grubler

and Fisk 2012; Kahn Ribeiro et al. 2012; Raji et al. 2015; Dulac 2013; Martínez-Jaramillo et al. 2017; Goldthau 2014; Meltzer 2016

References used in this assessment: Impacts of mitigation options on specific targets of the 17 SDGs, for environmental dimensions (Table 5.1c):

Vassolo and Döll 2005; Fricko et al. 2016; Holland et al. 2015; Nguyen et al. 2014; Hejazi et al. 2015; Song et al. 2016; Meldrum et al. 2013; Byers et al. 2016; Brandl et al. 2017; Bartos and Chester 2014; Hendrickson and Horvath 2014; Vidic et al. 2013; Tiedeman et al. 2016; Webster et al. 2013; Zhang et al. 2014; Wright et al. 2017; Rao and Pachauri 2017; Cibirin et al. 2016; Bilton et al. 2011; Scott 2011; Kern et al. 2014; Bonsch et al. 2016; Gao and Bryan 2017b; Taniwaki et al. 2017; Woodbury et al. 2017; Griffiths et al. 2017; Ha and Wu 2017; Ziv et al. 2012; Grill et al. 2015; Grubert et al. 2014; De Stefano et al. 2017; Raptis et al. 2016; Khan and Hanjra 2009; Mekonnen and Hoekstra 2012; Bajželj et al. 2014; Ran et al. 2016; Walker et al. 2014; Kong et al. 2016; Smith 2016; Kavvada et al. 2016; Köhler et al. 2013; Vierros 2017; McCollum et al.; Buck and Krause 2012; Michler-Cieluch et al. 2009; WBGU 2013; Inger et al. 2009; Caldeira and Wickett 2003; Gruber 2011; The Royal Society 2005; Shi et al. 2017; IPCC 2014c; Smith et al. 2013; Koornneef et al. 2011; Singh et al. 2011; Hertwich et al. 2008; Veltman et al. 2010; Corsten et al. 2013; Bailis et al. 2015; Bazilian et al. 2011; Karekezi et al. 2012; Winter et al. 2015; Smith et al. 2010; Kim and Brownstone 2013