Catalog of State Actions
Agriculture, Forestry, and Waste Management Working Group

A catalog of state-level, GHG-reducing actions and policy options based on actions undertaken or considered by state, local and private actors.

Key to Future Rankings of Options in the Tables that Follow:

Potential GHG Emission Reductions 1/	Potential Cost or Cost Savings 1/ 2/
High (H): At least 1.0 million metric tons (MMt) carbon dioxide equivalent (CO_2e) per year by 2020	**High (H)**: $50 per metric ton CO_2e (tCO_2e) or above
Medium (M): From 0.1 to 1.0 $MMtCO_2e$ per year by 2020	**Medium (M):** \$5-50/tCO_2e
Low (L): Less than 0.1 $MMtCO_2e$ per year by 2020, or 1 MMtCO2e by 2050	**Low (L):** Less than \$5/tCO_2e
Uncertain (U): Not able to estimate at this time	**Negative (Neg):** Net cost savings
	Uncertain (U): Not able to estimate at this time
1/ Several measures may overlap in terms of emissions reductions and/or cost impacts. Estimates assume measures would be implemented independently from other measures. 2/ Costs are denoted by a positive number. Cost savings (i.e., "negative costs") are denoted by a negative number.	

Definition of "Priorities for Analysis":

- **High:** High priority options will be analyzed first.
- **Medium:** Medium priority options will be analyzed next, time and resources permitting.
- **Low**: Low priority options will be analyzed last, time and resources permitting.

Notation of Options:

* **Options marked in bold an asterisk (*)** indicate some of the related state actions that are approved or underway, as described further in the companion options description document. TWG members are encouraged to provide information on other relevant actions.

Agriculture, Forestry, and Waste Management (AFW)

Option No.	GHG Reduction Policy Option	Potential GHG Emissions Reduction	Cost per Ton	Other Considerations: Jobs, Fuel Imports, Externalities, Feasibility	Priority for Analysis	Notes / Related Actions in MD
AFW-1	**AGRICULTURE – PRODUCTION OF ENERGY**					
1.1	Expanded Use of Biomass Feedstocks for Energy Production	L-M	M	Need to identify viable feedstocks; could include residues as well as energy crops. Poultry waste a potentially important MD feedstock.		Renewable Portfolio Standard; Renewable Electricity Production Credit Note linkage to biomass energy option in forestry sector.
1.2	In-state Liquid Biofuels Production	M-H	M-H	Includes purpose-grown crops (e.g. switchgrass) as well as traditional starch and oil production crops. Cost dependent on design of incentives program/other implementation mechanisms		Renewable Fuels Incentive Act; Renewable Fuels Taskforce; biodiesel mixing station on the lower shore in MD Note linkage to biofuels options in forestry and waste sectors.
1.3	Manure Digesters/Other Waste Energy Utilization	L-M	M-H			Clean Energy Incentive Act Note: Currently there are no digesters in MD. Linked with Option 2.1 below; also potential linkage to organic waste management (Option 9.6)
AFW-2	**AGRICULTURE – LIVESTOCK**					
2.1	Manure Management (manure utilization/methane capture)	L	L	May not be sufficient scientific basis supporting N_2O reductions		Clean Energy Incentive Act
2.2	Changes in Animal Feed	L	L-M			
2.3	Rotational Grazing (Improve	L	L			

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	Grazing Crops and/or Management)					
2.4	Utilize Biofilters to Control CAFO Emissions	L	?			
2.5	Increase Pasturing and Lower Densities	L	?			MD Nutrient Management Act dictates spreading rates.
AFW-3	**AGRICULTURE – CROP PRODUCTION**					
3.1	Soil Carbon Management	M	L	Additional?		MD funding assistance is available.
3.2	Advanced Nutrient Management (this option goes beyond Nutrient Mgmt as currently practiced/regulated in MD and can incorporate nutrient trading.)	L-M	L			A Nutrient Management Plan is required by MD Nutrient Management Act (1998). MD Department of Ag to provide recommendations on options for nutrient trading this fall.
3.3	Technology Improvements to Increase Efficiency	L	?			
3.4	Water Management	L	L			
AFW-4	**AGRICULTURE – LAND USE CHANGE**					
4.1	Land Use Management that Promotes Grassland Cover	L	L	Available land could be limited		MD does not participate in the Conservation Reserve Program (CRP) but rather in the Conservation Reserve Enhancement Program (CREP).
4.2	Preserve Open Space/Agricultural Land	L	M-H	Difficult to quantify additional indirect benefits from more efficient development. Reductions may vary depending on above and below ground carbon levels and level of VMT reduction achieved		MD has a many diverse open space initiatives - over $200 mil/yr.

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AFW-5	**AGRICULTURE – FARMING PRACTICES**					
5.1	Reductions in On-Farm Energy Use	L	Neg-L			Clean Energy Incentive Act; Farm Energy Audit Program; State Transportation Initiatives
5.2	Promotion of Farming Practices that Achieve GHG Benefits	L	?			Could include organic farming methods that have been shown to produce net GHG benefits
5.3	Programs to Support Local Farming/Buy Local	L-M	?	Difficult to fully account for benefits and costs		MD Dept of Ag Buy Local program.
AFW-6	**FORESTRY – PRODUCTION OF ENERGY IN FORESTRY AND URBAN TREE MANAGEMENT**					
6.1	Expanded Use of Forest Biomass Feedstocks for Electricity, Heat and Steam Production	M-H	L-M	Costs vary dramatically depending on implementation mechanisms		
6.2	In-state Liquid Biofuels Production	L-H	?	Benefit dependent on amount of residue diverted to fuel		Renewable Fuels Incentive Act
6.3	Improved Energy Capture from Wood Waste Combustion	L-M	L-M	Reductions depend on available acreage, technology employed and distance to end use		
6.4	Improved Commercialization of Biomass Gasification and Combined Cycle	U	?	Reductions dependent on assumed technology penetration; costs dependent on structure of incentives program		
AFW-7	**FORESTRY – BIOMASS PROTECTION AND MANAGEMENT**					
7.1	Forest Protection – Reduced Clearing And Conversion to Non-forest Cover	M-H	M			
7.2	Urban Forestry	L-M	L-M	Many ancillary benefits		MD SIP; New ozone

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				including improved or maintained quality of life for people in improved urban forests as well as wildlife, recreation and watershed improvements		mitigation voluntary measure
7.3	Afforestation/Reforestation	M-H	L-M			Forest Conservation Act; RGGI.
7.4	Forest Management for Carbon Sequestration	M	L-M			
7.5	Mitigation of Forest Carbon Sequestration Loss and Emissions Due to Wildfire	L	L			This option is of less concern than 7.6.
7.6	Mitigation of Forest Loss Due to Insects/Disease	L	L-M			More significant problems have been invasive species and pests.
AFW-8	**FORESTRY – WOOD PRODUCTS AND WASTE**					
8.1	Improved Mill Waste Recovery – Utilization of Sawmill Residues & Emissions	L-H	L-M			Not much opportunity to increase use of residues. Most residues currently used although maybe not for energy.
8.2	Improved Wood Waste and Logging Residue Recovery	L-H	L-M	Supports much-needed emerging markets for low-quality wood. Note that this encompass all wood wastes, such as tree maintenance trimmings.		In MD 50% of harvested trees remain on-site. Capturing this carbon source could serve as a very significant offset . Eastern Correctional Institute stands as a 20-year testament to successfully utilizing wood waste for energy.

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8.3	Expanded Use of Wood Products for Building Materials	L-M	L-M	Forest products manufactured locally (or regionally) would offset carbon inputs from concrete,steel, or even imported wood.		Possibly through revisions to LEED standards or other certification programs such as Green Globes.
8.4	Reduction in Logging Industry Energy Use	L	L-M	Free market will likely impact this moreso than any public policy ever will.		Draft nominal cost rating assumed to parallel AFW 5.1
8.5	Programs to Support Buying Sustainable Local Wood Products	L-M	L	Would support local markets for forest products thereby incentiving the retention and stewardship of local forests.		Primary benefit would be from avoided transportation. See comments above re: LEED and Green Globes.
AFW –9	**WASTE MANAGEMENT – WASTE MANAGEMENT STRATEGIES**					
9.1	Advanced Recycling	M-H	L-M	Reductions capture landfill emissions and energy reductions for the use of recycled products versus those from raw materials; reductions occur both within and outside MD		
9.2	Promotion of Bioreactor Technology (Advanced Municipal Solid Waste Management Practices)	L-M	L-M			Clean Energy Incentive Act
9.3	Source Reduction Strategies	L-M	L			
9.4	Resource Management Contracting	?	?			
9.5	Waste Coal Recapture	?	?			
9.6	Enhanced Management of Organic Waste	M	L-M	Reductions occur at landfill and also via use of energy if organics are used to generate biogas		Note potential linkage to Option 1.3.

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9.7	Promotion of New & Existing Technologies for Waste Energy Conversion	L-M	?	Benefits dependent on penetration of new/existing technologies; costs dependent on structure of incentives program.		Clean Energy Incentive Act
AFW –10	**WASTE MANAGEMENT – LANDFILL GAS STRATEGIES**					
10.1	Flare Landfill Methane at non-NSPS (smaller) Sites	M-H	M-H	Technical feasibility of collecting and controlling methane at some sites is questionable		
10.2	Methane and Biogas Energy Programs	?	M-H			Clean Energy Incentive Act
10.3	Landfill Methane Energy Programs	M	Neg-L	Collection and control could occur at sites currently flared or at uncontrolled sites.		Clean Energy Incentive Act
AFW-11	**WASTE MANAGEMENT – WASTEWATER ACTIVITIES**					
11.1	Energy Efficiency Improvements	L	Neg-L			RGGI
11.2	Lower Waste Processing Needs (lower water consumption, waste production)	L	?	Costs are industry and technology specific		
11.3	Install Digesters and Turbines or Engines	L-M	M			Clean Energy Incentive Act
11.4	Restoration of Soil Organic Carbon from Application of WWTP Biosolids	L	?			Note linkage to agricultural soil carbon option (3.1).
11.5	Heat Recovery	L	?			
11.6	Algae and Bio-oils	L	?			Note linkage to the agriculture and forestry biofuels options.