



Green Marine: An environmental program to establish sustainability in marine transportation



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ABSTRACT

European maritime companies have adopted programs to limit operational impacts on the environment. For maritime companies in North America, the Green Marine Environmental Program (GMEP) offers a framework to establish and reduce environmental footprints. Green Marine (GM) participants demonstrate annual improvements of specific environmental performance indicators (e.g., reductions in air pollution emissions) to maintain certification. Participants complete annual self-evaluations with results determining rankings for performance indicators on a 1-to-5 scale. Self-evaluations are independently verified every two years to ensure rigor and individual results are made publicly available annually to achieve transparency. GM benefits the marine industry across North America by encouraging sustainable development initiatives. GM's credibility is reflected through a diverse network of environmental groups and government agencies that endorse and help shape the program. Merits of this relatively new maritime certification (not previously described in the academic literature), are discussed.

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1. Introduction

North American marine ports are vitally important for transportation and the economy (Wark and Cox, 1992). For example, within the US alone, marine ports are responsible for transporting 99% (by weight) of overseas cargo and 65% (by value), and account for the movement of \$3.8 billion worth of goods each day of all US cargo (AAPA, American Association of Port Authorities, 2015). Historically, ports and shipping companies have operated with little regard for environmental impacts (e.g., use of chemical-based antifoulants on ships (Coray and Bard, 2006); releases of ballast water containing invasive species (Pereira and Brinati, 2012; Steichen et al., 2014; Rivas-Hermann et al., 2015); oil spills from ships or shore (Kim, 2002); marine debris (Walker et al., 2006), or widespread sediment contamination (Walker and Grant, 2015; Walker et al., 2013a,b,c, 2015a; MacAskill et al., 2016).

Legislation aimed at protecting the environment associated with operation and management of port facilities and marine transportation companies are now well established (Wooldridge et al., 1999; Birch and Taylor, 2002). For example, the 1998 ECOPORTS project (Towards a Sustainable Transport Network), was developed by the Valencia Port Authority (VPA), to establish an Environmental Management System (EMS) in industrial harbors (ECOPORTS Valencia, 2000). Many European ports

have already adopted environmental performance indicator (PI) frameworks such as, ECOPORTS, Port Environmental Review System (PERS) (www.ecoport.com), INDAPORT and PORTOPIA (www.portopia.eu) aimed towards sustainable port management (Darbra et al., 2004, 2005, 2009; Peris-Mora et al., 2005; Seguí et al., 2016).

Until recently, maritime companies in North America operated without a coordinated sustainable framework. To mitigate against potential impacts to the environment, maritime companies in North America recently adopted a voluntary certification program aimed at reducing their environmental footprint to achieve greater sustainability, above and beyond regulatory compliance. The Green Marine Environmental Program (GMEP; <http://www.green-marine.org/>) was established in 2007 for North American maritime companies, and participants include: shipowners, ports, terminals, shipyards and seaway corporations (Green Marine, 2015a). The GMEP addresses key environmental issues through 11 PI's. To receive certification, each participant must benchmark their environmental performance by completing a detailed annual self-evaluation. Results determine the participant's ranking for each PI on a 1-to-5 scale evaluated against performance indicators (Fig. 1; Table 1). The Green Marine (GM) Level 1 criteria represents 'regulatory monitoring' (baseline) and Level 5 indicates leadership and excellence. Level 1 integrate specific requirements aimed at ensuring companies are aware of relevant environmental laws and regulations. During its external verification, a company must demonstrate to the verifier that concrete actions are taken for monitoring regulations on a regular basis at least annually to achieve Level 1 by using tools such as:

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Fig. 1. Performance indicator scale (1 to 5). Level 1 representing regulatory monitoring (baseline) and Level 5 indicating excellence and leadership.

regulatory monitoring software, notifications from governments, class societies or associations, consultations with governments and environmental compliance audits. The GM indicator criteria are as follows:

- Level 1 – Monitoring of regulations
- Level 2 – Systematic use of a defined number of best practices
- Level 3 – Integration of best practices into an adopted management plan and quantifiable understanding of environmental impacts
- Level 4 – Introduction of new technologies
- Level 5 – Excellence and leadership

Participants have to demonstrate annual improvements of any environmental PI's (e.g., reductions in greenhouse gas [GHG] and air pollution emissions) in measurable ways to maintain their certification. Reports are independently verified every two years to ensure rigor and integrity of the program. Transparency is achieved, with the GMPE, as individual results are made publically available annually (Green Marine, 2014). GM benefits the marine industry across North America by encouraging sustainable development initiatives which is supported by a diverse network of environmental groups and government agencies.

This paper aims to (i) describe this relatively new certification program, which has never before been described in the academic literature; (ii) explore recent GM certification results; (iii) discuss benefits and potential limitations that may apply within the current framework; and, (iv) make recommendations to improve management of North American maritime operations.

Table 1

Performance indicator summary. Green refers to shipowners, blue refers to ports and terminals.

Performance indicator	Responsible participant	
	Shipowners	Ports and terminals
Aquatic invasive species	Green	
Cargo residues	Green	
Community impacts		Blue
Dry bulk handling and storage		Blue
Environmental leadership		Blue
Garbage management	Green	
Greenhouse gas emissions	Green	Blue
Oily water	Green	
Pollutant air emissions NOx	Green	
Pollutant air emissions SOx and PM	Green	
Prevention of spills and leakages		Blue

1.1. Methodology and approach

An appraisal and review was made of the program focusing mainly on the GMPE website (<http://www.green-marine.org/program/> (Green Marine Environmental Program, 2015a)) and included an interpretation of recent PI results published therein. Benefits to the environment and potential limitations of the current program are discussed. Based on this preliminary review, suggestions are made to some elements of the GMPE that could be improved.

2. Framework criteria for certification

To obtain certification, companies must:

- Respect GMPE's guiding principles – GM participants agree to: demonstrate corporate leadership for best environmental practices in accordance with a sustainable development approach; conduct activities responsibly to minimize environmental impacts; aim for continuous improvement of environmental performance; develop and promote voluntary protection measures; integrate sustainable development practices that are technically and economically achievable; and, collaborate with governments and stakeholders to implement GM plans.
- Pay GM annual membership fees – fees vary according to participant's size of operations and type of activity (maximum \$15,375 CAD/USD in 2015).
- Submit annual self-evaluation report – participants must self-evaluate environmental performance on a 1 to 5 scale and submit annual reports.
- Agree to external verification – results must be submitted for third party verification every two years using a GM accredited verifier (Green Marine, 2015a). The first verification is required within the first two years of joining the program. Certification and use of the «Green Marine certified» logo are awarded only after successful verification and are valid for two years. Verification includes site visits and confirmation of documented proof and justification of self-evaluation.
- GM accredited verifiers – all verifiers receive training to understand evaluation, verification and certification process and are selected based on sector experience, accreditation and environmental experience. New verifier recruitment and training includes a competency test for all candidates, and quality control measures to ensure consistency of the verification process.
- Publication of results – each company agrees to publication of their results with certification status in GM's annual progress report and website. Results are also unveiled during GM's annual conference (GreenTech).
- Achieve year-over-year improvement – participants must achieve, during the first year of participation, Level 2 (i.e., a systematic use of a defined number of best practices) for at least one PI and during the second year of participation, demonstrate an annual improvement of one level in at least one PI until Level 2 is achieved for all applicable PI's.
- Benchmarking environmental PI's – participants must benchmark their annual environmental performance through GMPE's detailed framework to receive certification. Self-evaluation guides for shipowners, ports and St. Lawrence Seaway corporations and for terminals and shipyards are designed to assess their environmental performance with

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