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Alignment of the 2030 Agenda to the port industry

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Abstract

The United Nations' 2030 Agenda for Sustainable Development (2030 Agenda) serves as a global framework for addressing sustainability challenges. The port industry (PI) plays a crucial role in achieving the Sustainable Development Goals (SDGs) as a vital component of the global economy and supply chains. This research paper addresses the alignment between the PI and the 2030 Agenda. The study aims to bridge the research gap by exploring the extent to which the PI aligns with the SDGs and proposes a framework for implementation. Through an analysis of literature, this study identifies the relevant SDG targets for the PI. The original wordings of the relevant targets were adapted to make them meaningful to the PI. The adapted targets were validated by eight Canadian Port authorities to ensure their relevance and clarity. The alignment resulted in the identification of 69 targets, representing all 17 SDGs.

KEYWORDS

2030 agenda, port industry, SDG localization, SDG target, sustainable development goals

1 | INTRODUCTION

The United Nations 2030 Agenda for Sustainable Development (2030 Agenda) is a global framework including 17 Sustainable Development Goals (SDGs) and 169 targets (United Nations, 2015). The SDGs include the three “recognized” dimensions of sustainable development (SD): social, environmental and economic (United Nations, 2015). Adopted unanimously in 2015 it represents the world's aspirations for 2030 (Grainger-Brown & Malekpour, 2019). The SDGs are recognized worldwide as a global framework for SD implementation (Allen et al., 2020; Krellenberg et al., 2019). While the SDGs and targets were first designed for the global level (Zinkernagel et al., 2018), the 2030 Agenda is universal and applies to all governments and actors (Hansson et al., 2019) regardless of their level of intervention, including the private sector (Jha & Rangarajan, 2020;

Scheyvens et al., 2016). Indeed, although the SDGs and their targets are nation-oriented, the private sector plays an essential role in their achievement (Caliskan, 2022; Pizzi et al., 2020). The private sector covers a multitude of activities with a capacity for action on different SDGs (Jha & Rangarajan, 2020; Scheyvens et al., 2016; van Zanten & van Tulder, 2018).

At the interface of public authorities and private sector, the port industry (PI) plays an essential role in the global economy and supply chains (Alamouh et al., 2021; Oh et al., 2018). Activities related to the PI can generate positive and negative impacts on the environment, the economy and society (Alamouh et al., 2021; Hossain et al., 2021), which positions it strategically to implement the SDGs and contribute to their global achievement (World Ports Sustainability Program, 2020). Substantial literature covers the environmental impacts of the PI activities (Acciaro et al., 2014; Alamouh et al., 2021; Bartosiewicz & Kucharski, 2023; Hossain et al., 2019; Lim et al., 2019; Notteboom et al., 2020; Peris-Mora et al., 2005; Puig et al., 2015). Without being exhaustive, these impacts include air quality, greenhouse gas emissions, energy consumption, noise, waste

In this paper, we show the alignment between the port industry and the 2030 Agenda. This is significant because it bridge the research gap by exploring the extent to which the port industry aligns with the Sustainable Development Goals and targets and proposes a framework for their localization in ports.

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management, water quality, habitat conservation and dredging (Comtois & Slack, 2007; ESPO, 2021). The social and economic impacts of the PI are much less documented in the literature. They include direct and indirect employment, relationship with the local community, training, gender equality, workplace health and safety, investment and, economic contribution at the local and global levels (ESPO, 2021; Katuwawala & Bandara, 2022; Lim et al., 2019).

Literature shows that the concept of “port sustainability” focuses almost exclusively on the environmental dimension of SD (Alamouh et al., 2021; Asgari et al., 2015; Caliskan, 2022). To implement SD, the PI must integrate its three dimensions. In doing so, the PI can expect positive strategic positioning (Hossain et al., 2021; Oh et al., 2018) encountering various expectations from stakeholders (Ignaccolo et al., 2020; Katuwawala & Bandara, 2022; Lim et al., 2019; Oh et al., 2018). The implementation of SD will reduce costs and risks, give access to markets, gain competitive advantage, develop a positive reputation, create value on the long term and, reduce pressure on resources (van der Waal & Thijssens, 2020).

For Grainger-Brown and Malekpour (2019), the SDG framework represents a relevant point to pursue a competitive advantage. Ports have resources and capacities representing opportunities to implement the SDGs: “sector-specific expertise and knowledge, managerial and enforcement capacity” (Berrone et al., 2019). Moreover, they are located at several interfaces whether in the supply chain or in their geographical location (Katuwawala & Bandara, 2022). However, as PricewaterhouseCoopers (2019) points out: “While there is a general acknowledgement of the importance of the [SDGs], there is still not enough understanding of what concrete action should be or is taking place.”

For years, port sustainability mainly focuses on the environmental dimension often referring to environmental sustainability (Acciaro et al., 2014; Alamouh et al., 2021; Caliskan, 2022; Darbra et al., 2009; Davarzani et al., 2016). Although, few studies apply the SDGs to the PI, Sciberras and Silva (2018) analyzed the role of the International Maritime Organization (IMO) in implementing the SDGs. They conclude a lack of leadership and knowledge and, a weak response to SDG. Wang et al. (2020) linked maritime activities to the SDGs highlighting the industry's potential contribution to the SDGs and pinpointing to the lack of research on the topic. Katuwawala and Bandara (2022) identified four factors as barriers for PI contribution to SDGs: “deficient collaborative policies, structural and managerial constraints, market constraints and the absence of a well-established SDG-driven global port framework”. Caliskan (2022) showed that some port authorities already refer to SDGs in their sustainability reports. Referring to a study of European ports, he notes that a small proportion (14%) of these ports refer directly to the SDGs (Ambarli, Antwerp, Barcelona, London, Hamburg, and Wilhelmshaven). In Europe and across the world, other ports include actions regarding the SDGs or intend to do so increasingly.

Therefore, research is needed to understand how to integrate and implement the SDGs in the private sector including the PI (Alamouh et al., 2021; Argyriou et al., 2022; Haffar & Searcy, 2018; Mio et al., 2020; Wicki & Hansen, 2019). This study aims to fill the gap of knowledge on the absence of SDG-driven global port

framework by identifying the SDG targets relevant to the PI in order to develop a framework adapted to the needs of the industry. By doing so, the SDG target alignment with the PI will be demonstrated. Our approach applied to this sector will be replicable for all sectors of economic activity, which will make it possible to fill knowledge gaps for the implementation of the SDGs in organizations. Moreover, the research goes beyond environmental sustainability, which does not include the principle of integrated sustainability. The approach adapted to the PI will fill a knowledge gap in port sustainability by proposing a reference framework that integrates the three dimensions of sustainable development.

To achieve this objective, an inventory was carried out on the indicators, standards, certifications and good practice guides that implement and assess sustainability in the PI. A contextualization of the 2030 Agenda to the PI was done by (1) identifying industry-relevant SDG targets, and (2) adapting the wording (without distorting the meaning). The study goes beyond current good practice by proposing an original reference framework that will allow the PI to contribute to the SDGs at the target level. This is all the more significant since the PI occupies an extremely important strategic position in the global supply chain at the interface between private companies, local and national governments.

2 | MATERIALS AND METHODS

The approach is divided into several steps where each provides inputs for the following steps (Figure 1).

2.1 | Literature review methodology for SDG alignment with the port industry

To align the SDG targets with the PI, a literature review was carried out to identify reference frameworks from the PI that were linked to the 2030 Agenda. The document search was conducted between August 2022 and January 2023. The following terms were used in the Scopus database and in the Google search engine to identify relevant documents: “port” or “port industry” or “port authority” and “Sustainable Development Goals” or “SDGs” or “Agenda 2030”. The literature review included scientific articles, certifications, programs, good practice guides and gray literature: 14 documents were selected in the first screening. A document was retained (i) if it was linked to SDGs or SDG targets; or (ii) if it contained information easily aligned with the SDG targets. Seven documents were kept in the final selection based on these criteria (Table 1).

To identify the relevant SDG targets, a matrix was built in which alignments were noted and directly identified in the documents. For documents where alignments were at the SDG level or absent, alignments identified were noted in the matrix. When possible, examples of actions or issues related to the targets were noted. These examples make it possible to justify the relevance of the targets and will be used later in the development of a prioritization grid.

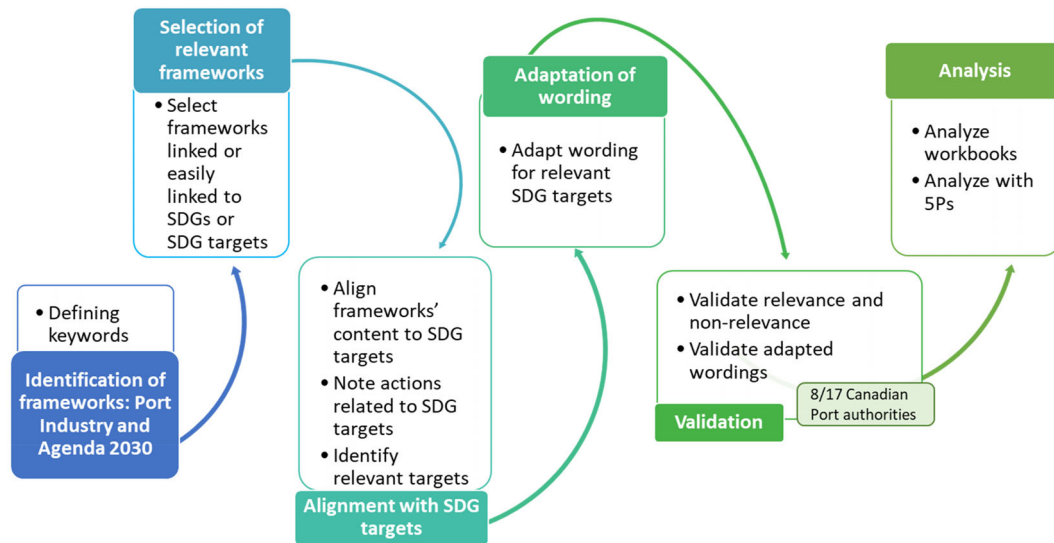


FIGURE 1 Steps of the applied approach for alignment of the 2030 Agenda to the Port Industry.

TABLE 1 Description of documents selected for SDG target alignment with the Port Industry.

Author	Title	Year	Type of reference	Alignment level	Reference
International Association of Ports and Cities (AIVP)	10 Goals for Sustainable Port Cities	Not indicated	Program	SDG level	(International Association of Ports and Cities, n.d.)
Comtois and Slack (C&S)	Restructuring the Maritime Transportation Industry: Global Overview of Sustainable Development Practices	2007	Government report	No alignment	(Comtois & Slack, 2007)
European Sea Ports Organization (ESPO)	ESPO Green Guide 2021- A manual for European ports toward a green future	2021	Guide	No alignment	(ESPO, 2021)
Green Marine (GM)	Green Marine Environmental Program	2022	Certification	No alignment	(Green Marine, 2022)
MacNeil, Jennifer L. (JLM)	Evaluating the efficacy of sustainability initiatives and development of a framework to improve sustainability in the Canadian port sector	2021	Master's Thesis	SDG target level	(MacNeil, 2021)
Schipper, Cor (CS)	Understanding the Sustainable Development Goals Approach for Ports of the Future	2019	Conference Paper	SDG target level	(Schipper, 2019)
World Ports Sustainability Program (WPSP)	World Ports Sustainability Report 2020	2020	Program	SDG level	(World Ports Sustainability Program, 2020)

2.2 | Adaptation of the SDG wording for the port industry

After identifying the relevant targets, their original wordings were adapted. The purpose of adapting the target wordings is to keep the meaning of the targets while making them more meaningful to the PI (Tremblay et al., 2021). The adaptation makes it possible to simplify wordings, which may be problematic for non-experts (Dalampira & Nastis, 2020) and it promotes ownership and mobilization of stakeholders (Gustafsson & Ivner, 2018; Tremblay et al., 2021; Weitz et al., 2015). Target wordings has been adjusted by removing references to quantification, years or geographical levels (global, national

or other). For example, Target 3.6: “By 2020, halve the number of global deaths and injuries from road traffic accidents” becomes “Reduce in port and industrial-port areas the number of deaths and injuries due to mobile equipment”. Another example, Target 7.3 “By 2030, double the global rate of improvement in energy efficiency” becomes “Improve the energy efficiency of port activities and exercise mobilizing leadership in this regard for all sectors of the value chain”.

The 17 port authorities that are members of the Association of Canadian Port Authorities were invited to participate in a validation exercise. Eight of the 17 (47%) Canadian Port authorities (Hamilton-Oshawa Port Authority, Montreal Port Authority, Nanaimo Port

TABLE 2 Characteristics of the Canadian port authorities that participated in the validation (Data comes from the 2022 annual reports of the port authorities).

Port authorities	Province	Region	Location	Handling volume in gross weight (Mt)	Number of employees	Type of port	Number of vessels	Annual revenue (M\$)
Montreal	Quebec	St. Lawrence	Urban	35,3	275	Inland port	2156	134
Nanaimo (2023)	British-Columbia	Pacific	Urban	3,9	28	Seaport	91	12.8
Oshawa-Hamilton	Ontario	Great Lakes	Urban	10	60	Inland port	650	40
Quebec	Quebec	St. Lawrence	Urban	27.7	120	Inland port	1000	50
Saguenay	Quebec	St. Lawrence	Peri-urban	0.645	13	Inland port	69	5,3
Saint John	New Brunswick	Atlantic	Urban	27.5	52	Seaport	921	27
Sept-Iles	Quebec	St. Lawrence	Urban	33.4	16	Seaport	513	28
Trois-Rivieres	Quebec	St. Lawrence	Urban	4.3	24	Inland port	242	14.2

SDG 1: No poverty - Target 1.2

Wording of the 2030 Agenda :
 1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions

Proposed wording :
 1.2 Contribute to the reduction of poverty in all its forms, particularly in the communities where port authorities operate

Examples of actions or issues related to the target :

- Be actively involved in local community organizations (GM)
- Support local social institutions (e.g. schools, orphanages, NGOs) (WPSP)
- Set a good minimum wage for the port employees and encourage similar practices in the port community (WPSP)
- Support local communities in need through social projects targeting sustainable growth (WPSP)

a. Indicate, for clarity and relevance, whether the proposed wording is (highlight your choices):

<u>Clarity</u>	<u>Relevance</u>
1. <u>Very clear</u>	1. Relevant for the port industry
2. <u>Clear</u>	2. Little relevance for the port industry
3. <u>Ambiguous</u>	3. Not relevant for the port industry
4. <u>Incomprehensible</u>	

b. Identify terms that are ambiguous or difficult to understand:

c. If necessary, suggest a wording :

FIGURE 2 Example of relevance and clarity validation sheet submitted to Canadian experts of the port industry.

Authority, Quebec Port Authority, Saguenay Port Authority, Saint John Port Authority, Sept-Iles Port Authority, Trois-Rivieres Port Authority) validated the relevance of the identified targets and the clarity of the adapted wordings. These eight port authorities come from the four Canadian Port regions (from east to west: Atlantic, St-Lawrence River, Great Lakes, Pacific). The eight port authorities are also representatives by the range of vessel traffic, handling

merchandise volume, economic, social and, environmental contexts (Table 2). Experts from those Port authorities validated the identification and adaptation of the relevant targets. To help them in their tasks, videos were previously prepared to explain (i) the global project of 2030 Agenda alignment to the PI; (ii) the instructions for the validation exercise and (iii) to present the SDG Target Prioritization Grid to be adapted in the later stages of the project. Participating ports did so

on a voluntary basis, which mainly explains the absence of some Canadian Port Authorities in this exercise. Each port authority received an identical participant workbook. The workbooks were completed between February and May 2023. Each port authority was free to choose its mode of operation to complete the exercise. This choice influenced the time taken to complete the workbook. Positions held by people who completed the workbooks include: Environment Director, Chairman of the Sustainable Development Committee, Senior advisor, Project Manager, Vice President Infrastructure and Environment, Environment and Sustainable Development Director, Vice President Engagement and Sustainable Development, CEO. The exercise consisted of assessing the relevance and clarity of the targets selected as relevant for the PI. A sheet corresponded to each of the SDG targets. These sheets included (Figure 2): (i) the original wording from the 2030 Agenda; (ii) the proposed adapted wording; (iii) a list of examples of actions and issues related to the target inspired by the reference document (Table 1); (iv) a table where participating port authorities were indicated to highlight their choices on “relevance for the PI” and “clarity”; and (v) an open space to identify ambiguous terms and, if necessary, to suggest alternative wordings.

A list of target themes deemed irrelevant followed the validation sheets. Participants were invited to identify from that list of targets those that they considered relevant for the PI.

Results were analyzed once the workbooks were returned. Means and standard deviations were calculated for the “relevance” and “clarity” parameters for all SDG targets identified as potentially relevant. Answers were analyzed when given for the targets that were not included in those potentially relevant for the PI. Where necessary, the wording of the targets was reformulated based on the comments received by the participating port authorities. Moreover, appropriate wording for SDG targets that had not been selected but deemed relevant by industry representatives has been formulated. The last step was to share to the PI, for final validation, the list of relevant SDG targets with the appropriate wordings.

This methodology implies triangulation as defined in Gibbert and Ruigrok (2010): “adopt different angles from which to look at the same phenomenon, by using different data collection strategies and different data sources”. Data were collected from seven different documents, then external validity was used on the format of a review by key informants.

2.3 | Alignment with the five pillars of the 2030 agenda

The classification of Tremblay et al. (2020) was used to analyze the consideration of the five pillars (5Ps) of the 2030 Agenda. The pillars “People”, “Planet” and “Prosperity” are directly linked to the three recognized dimensions of sustainable development social, environmental and economic, respectively. The other two pillars of the 2030 Agenda refer to “Peace”, a condition and a purpose of sustainable development, and, to “Partnership”, an essential aspect of the means

of implementation of the SDGs at the global scale. According to the classification of SDG targets by Tremblay et al. (2020), a target can be associated with several pillars. The coverage of the 5Ps represents the percentage of the targets considered in the different reference frameworks for each pillar (Population, Planet, Prosperity, Peace and, Partnership).

3 | RESULTS

3.1 | Identification of the SDG targets

A total of 69 potentially relevant targets were identified through the analysis and alignment of the seven selected reference frameworks (Table 3). All SDGs were represented. An average of 32 targets were found per reference framework. The World Port Sustainability Program (2020) was the framework with the highest number of targets with 51. Four targets were present across the seven reference frameworks: target 6.3 (Water quality; water treatment, wastewater); target 7.3 (Energy efficiency); target 9.4 (Upgrade infrastructure; resource-use efficiency; environmentally sound technologies); and target 12.4 (Chemicals and hazardous waste management; spills to air, water, soil; adverse impacts on health and the environment). Ten other targets were present across six reference frameworks but the vast majority of identified targets (45/69) fell within three or fewer reference frameworks.

3.2 | Adaptation of the SDG target labels

Two targets were rejected following the validation with the eight Canadian port authorities. The rejected targets were target 1.4 (Access to basic services, property, natural resources, inheritance, new technologies, financial services) and target 10.2 (Empowerment; social, economic and political inclusion). Only one reference framework had links to these two targets. In return, two targets that did not appear in the former list of targets were deemed relevant and added. These are targets 14.5 (Marine and coastal protected areas) and 14.a (Scientific knowledge, research and transfer of marine technology). This change means that following the validation with the port authorities, 69 targets were kept from the 17 SDGs. The wording of these 69 targets was modified to make them suitable for the PI (Table 4).

3.3 | Proportion of SDG targets

All 17 SDGs had relevant targets for the PI. However, an imbalance was observed in the proportion of targets retained by SDG (Figure 3). While 80% of the targets of SDG 11 (Sustainable cities and communities) were relevant, less than 15% of SDG 2 (Zero Hunger), SDG 10 (Reduced inequalities) and SDG 17 (Partnerships for the goals) were kept in the alignment. In order, the other SDGs with the highest

TABLE 3 Matrix of identified relevant targets from the sustainable development goals (SDG) in the literature for the Port Industry. The literature was screened to these reference documents: International Association of Ports and Cities (AIVP), Comtois and Slack (C&S), European Sea Ports Organization (ESPO), Green Marine (GM), MacNeil, Jennifer L. (JLM), Schipper, Cor (CS), World Ports Sustainability Program (WPSP); details on these documents are presented in Table 1.

SDGs and identified relevant targets	AIVP	C&S	ESPO	GM	JLM	CS	WPSP	Total
SDG 1 – No Poverty								
1.2 – Relative poverty (national poverty line, other forms of poverty)				X			X	2
1.4 – Access to basic services, property, natural resources, inheritance, new technologies, financial services							X	1
1.5 – Resilience and vulnerability reduction – (Disaster Risk Reduction Strategy)	X	X		X				3
SDG 2 – Zero Hunger								
2.1 – Hunger; safe and nutritious food – (undernourishment, food insecurity)	X						X	2
SDG 3 – Good Health and Well-being								
3.4 – Non-communicable diseases, mental health, well-being – (cardiovascular diseases, cancer, diabetes, chronic respiratory diseases, suicide)	X	X					X	3
3.5 – Substance abuse, narcotics, drugs and alcohol							X	1
3.6 – Road accidents		X		X	X			3
3.9 – Deaths and illnesses due to hazardous chemicals, pollution and contamination (air, water, soil)		X	X	X	X		X	5
SDG 4 – Quality Education								
4.3 – Technical, vocational and university education	X						X	2
4.4 – Skills for employment and entrepreneurship	X					X	X	3
4.7 – Knowledge and skills to promote sustainable development		X		X			X	3
SDG 5 – Gender Equality								
5.1 – Discrimination against women/girls							X	1
5.5 – Participation of women in leadership positions (political, economic and public)					X		X	2
SDG 6 – Clean Water and Sanitation								
6.1 – Access to drinking water							X	1
6.3 – Water quality; water treatment, wastewater	X	X	X	X	X	X	X	7
6.4 – Water-use efficiency		X		X	X		X	4
6.5 – Integrated water resource management	X	X			X			3
6.6 – Protection and restoration of water-related ecosystems	X	X	X	X	X		X	6
SDG 7 – Affordable and Clean Energy								
7.2 – Renewable energy	X	X	X		X	X	X	6
7.3 – Energy efficiency	X	X	X	X	X	X	X	7
7.a – International cooperation, investment in renewable energy infrastructure							X	1
SDG 8 – Decent Work and Economic Growth								
8.1 – Economic growth							X	1
8.2 – Economic productivity (diversification, technological upgrading and innovation, high value-added sectors)						X	X	2
8.3 – Policy promoting productive activities, job creation, entrepreneurship, creativity and innovation; growth of micro-, small- and medium-sized enterprises					X		X	2
8.4 – Global resource efficiency	X	X	X	X				4
8.5 – Full and productive employment; decent work and equal pay – (hourly earnings)					X		X	2
8.8 – Labor rights, safe and secure working environment		X			X		X	3
8.9 – Sustainable tourism; promotion of local culture and products	X					X	X	3
SDG 9 – Industry, Innovation and Infrastructure								
9.1 – Sustainable infrastructure; economic development; well-being	X			X	X	X	X	5
9.2 – Sustainable industrialization	X							1
	X	X	X	X	X	X	X	7

TABLE 3 (Continued)

SDGs and identified relevant targets	AIVP	C&S	ESPO	GM	JLM	CS	WPSP	Total
9.4 – Upgrade infrastructure; resource-use efficiency; environmentally sound technologies								
9.5 – Research; technological capabilities; innovation	X			X	X			3
SDG 10 – Reduced Inequalities								
10.2 – Empowerment; social, economic and political inclusion							X	1
10.3 – Equality and inequality; elimination of discriminatory laws, policies and practices – (discrimination, harassment)	X						X	2
SDG 11 – Sustainable Cities and Communities								
11.2 – Transport system; road safety – (public transport)	X			X	X		X	4
11.3 – Sustainable urbanization; participatory, integrated planning and management	X							1
11.4 – Cultural and natural heritage	X			X				2
11.5 – Disasters	X	X			X		X	4
11.6 – Environmental impact of cities; air quality; waste management		X	X	X	X	X	X	6
11.7 – Green and public spaces	X							1
11.a – Economic, social and environmental links between urban, peri-urban and rural areas	X		X		X	X		4
11.b – Disaster resilience; disaster risk management	X							1
SDG 12 – Responsible Consumption and Production								
12.1 – Sustainable consumption and production programming – (Sustainable consumption and production action plan)		X		X			X	3
12.2 – Sustainable management; efficient use of natural resources	X	X	X	X	X		X	6
12.3 – Food waste, food losses	X						X	2
12.4 – Chemicals and waste management; spills to air, water, soil; adverse impacts on health and the environment – (hazardous waste)	X	X	X	X	X	X	X	7
12.5 – Waste generation		X	X	X	X	X	X	6
12.6 – Sustainable practices – (Corporate Social Responsibility)				X	X	X		3
12.8 – Information and awareness necessary for sustainable development		X		X			X	3
SDG 13 – Climate Action								
13.1 – Resilience and adaptation to climate change	X	X	X	X	X		X	6
13.2 – Climate change measures– (planning)	X	X	X	X	X	X		6
13.3 – Education, awareness and capacity building on climate change adaptation, mitigation and impact reduction			X		X	X	X	4
SDG 14 – Life Below Water								
14.1 – Marine pollution, marine debris, nutrient pollution (eutrophication, plastic debris)		X	X	X	X	X	X	6
14.2 – Marine and coastal ecosystems; ocean health and productivity	X	X	X	X	X		X	6
14.3 – Ocean acidification		X			X		X	3
14.4 – Fishing	X						X	2
14.7 – Sustainable use of marine resources; sustainable management of fisheries, aquaculture and tourism	X						X	2
SDG 15 – Life on Land								
15.1 – Terrestrial and inland freshwater ecosystems – (terrestrial biodiversity, freshwater biodiversity)	X	X	X	X			X	5
15.2 – Sustainable forest management; deforestation; afforestation and reforestation	X	X					X	3
15.3 – Desertification; degraded soils – (contaminated soils)		X	X	X				3
15.5 – Degradation of natural habitats; biodiversity; threatened species	X	X	X	X	X		X	6
15.8 – Invasive alien species		X		X	X			3
15.9 – Integration of ecosystem and biodiversity protection into planning				X	X			2

(Continues)

TABLE 3 (Continued)

SDGs and identified relevant targets	AIVP	C&S	ESPO	GM	JLM	CS	WPSP	Total
SDG 16 – Peace, Justice and Strong Institution								
16.4 – Illicit financial flows; arms trafficking; organized crime							X	1
16.6 – Effective, accountable and transparent institutions	X		X	X			X	4
16.7 – Participation in decision-making	X						X	2
16.10 – Public access to information; fundamental freedoms	X			X				2
SDG 17 – Partnership for the Goals								
17.16 – Partnerships for sustainable development			X				X	2
17.17 – Public, public-private and civil society partnerships	X				X			2
Total	39	31	22	33	33	16	51	

proportion of relevant targets were: SDG 14 (Life below water – 70%), SDG 12 (Responsible consumption and production – 64%), SDG 6 (Clean water and sanitation – 63%) and SDG 13 (Climate action – 60%).

3.4 | Alignment with the five pillars of the 2030 agenda

The six most covered SDGs in the 69-target framework for the PI had links with the “Planet” pillar/environmental dimension (Table 5); this is the most heavily covered pillar/dimension. The “Planet” pillar/environmental dimension is also the most covered by all the reference frameworks consulted (Figure 4). The “People” pillar/social dimension is the second most covered by the 69-target framework, followed by the “Peace” pillar, the “Prosperity” pillar/economic dimension and finally the “Partnership” pillar.

4 | DISCUSSION

To achieve the global goals of the 2030 Agenda, all actors must be mobilized, at all levels. As the Global Compact (2015) reminds us, the SDGs [especially their targets] are not relevant for every organization. In this sense, the Global Compact (2015) encourages organizations to determine the most meaningful and strategic SDGs [targets] depending on their type of activity and context. Therefore, it becomes essential to contextualize the 2030 Agenda to promote the mobilization of stakeholders.

The results show that it is possible to do this exercise for the PI. The approach aligns current sustainability frameworks in the PI with the SDG targets. The aim was to develop a reference framework that includes the three dimensions of sustainable development. In a way, this exercise allows to achieve the two purposes at once. This last aspect was clearly a weakness of the existing PI frameworks that focused almost exclusively on the environmental dimension and the “greening” of their activities (Hossain et al., 2021). Given the diversity of participant port locations (Table 2) the results are representative and robust.

4.1 | Completeness

The framework includes 69 targets in the 17 SDGs, making it the most comprehensive to date. By comparison, the frameworks used to identify relevant targets align to 32 targets on average (Table 1). The WPSP (2020) aligns with the most targets (51). Moreover, only two of these frameworks (out of 7) align directly with the SDG targets (MacNeil, 2021; Schipper, 2019). For the other five, the authors of the present article had to align the content of the frameworks with the SDG targets.

Although the 17 SDGs are represented across the 69 targets, there is no balance across the SDGs (Figure 3) and across the five pillars of the 2030 Agenda (United Nations, 2015) (Table 5). The analysis of the overall percentage of target coverage using the classification of Tremblay et al. (2020) demonstrates that, for all frameworks including the one on the 69 targets, it is always the “Planet” pillar/environmental dimension that dominates (Figure 4). This shows that the environmental dimension is an important issue for the PI. The 69-target framework is no exception. However, it includes several targets that affect the other dimensions of sustainable development. In this sense, the 69-target framework responds to the objective of aligning with the SDG targets while integrating the different dimensions of sustainable development.

4.2 | SDG in the PI

These results aligned substantially with those of Wang et al. (2020) who studied the alignment of the core business of the maritime industry with the 17 SDGs. Although this study is at the level of the SDGs, their results reveal that the main contributions of the maritime industry are to SDGs 8 (Decent work and economic growth), 9 (Industry, innovation and infrastructure), 12 (Responsible consumption and production) and, 14 (Life below water). Although there are important differences between the maritime industry and the PI, our results agree with a few exceptions related to the core businesses of the two industries. SDG 8 (Decent work and economic growth), 12 (Responsible consumption and production) and 14 (Life below water) are among the most covered in our terms of reference. Added to this are SDGs

TABLE 4 List of the 69 relevant targets from the sustainable development goals (SDG) with their adapted wording for the Port Industry.

Target	Adapted wording for the port industry
SDG 1	
1.2	Contribute to the reduction of poverty in all its forms, particularly in the communities where port authorities operate
1.5	Build the resilience and reduce exposure and vulnerability of populations, particularly in the communities where port authorities operate, to climate-related extreme events and other economic, social and environmental shocks and disasters
SDG 2	
2.1	Ensure that everyone, in particular the poor and people in vulnerable situations, have year-round access to healthy, nutritious and sufficient food, particularly in communities where port authorities operate
SDG 3	
3.4	Promote the mental health and well-being of employees, workers and partners of port authorities and the communities in which they operate through prevention, education and awareness, and encourage them to reduce non-communicable diseases
3.5	Strengthen the prevention, education, awareness and treatment of substance abuse including narcotic drug abuse and harmful use of alcohol among employees and workers of port authorities and within the communities where they operate
3.6	Reduce in port and industrial-port areas the number of deaths and injuries due to mobile equipment
3.9	Put in place measures to reduce emissions of hazardous chemicals, pollution and contamination of air, water and soil
SDG 4	
4.3	Promote access, under equal conditions, to technical, vocational or tertiary education, including university
4.4	Increase the percentage of employees and applicants with relevant technical and professional skills needed for employment and entrepreneurship within port authorities, industrial-port areas and the communities where they operate
4.7	Ensure that all employees acquire the knowledge and skills necessary to promote sustainable development
SDG 5	
5.1	End all forms of discrimination against gender and sexual orientation within port authorities
5.5	Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making
SDG 6	
6.1	Ensure access to drinking water at an affordable cost within the communities where port authorities operate
6.3	Improve water quality by reducing pollution, eliminating waste dumping, reducing emissions of chemicals and hazardous materials, decreasing the proportion of untreated sewage, and increasing recycling and safe reuse of water
6.4	Establish in all port operations a respectful and sustainable management of water resources and guarantee the sustainability of freshwater sources
6.5	Participate in the implementation of integrated water resources management at all levels, including through cooperation between ports and local communities
6.6	Protect and contribute to the restoration of water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
SDG 7	
7.2	Increase the share of renewable energy or energy with a lower carbon footprint in the energy supply sources of port authorities and industrial-port areas
7.3	Improve the energy efficiency of port activities and exercise mobilizing leadership in this regard for all sectors of the value chain
7.a	Promote international cooperation to facilitate access to renewable energy research and technologies, energy efficiency, investment in renewable energy infrastructure and circular consumption of renewable energy within port authorities and industrial-port areas
SDG 8	
8.1	Promote wealth creation in the communities and industrial-port areas where port authorities operate
8.2	Achieve higher levels of economic productivity through diversification, technological upgrading and innovation
8.3	Promote policies that promote the creation of decent jobs, entrepreneurship and innovation and that stimulate the growth of micro, small and medium-sized enterprises in order to facilitate their integration into the PI
8.4	Improve the efficient use of resources, from the point of view of consumption and production, by prioritizing circular economy and socio-ecological transition projects in order to reduce the environmental footprint of port activities
8.5	Guarantee all employees decent work and access to pay equity
8.8	Promote worker well-being, workplace safety and ensure the protection of all workers
8.9	Contribute to the development of sustainable tourism that creates jobs and promotes local culture and products in communities where port authorities operate
SDG 9	
9.1	Establish quality, reliable, sustainable and resilient infrastructure to support development in communities where port authorities operate

(Continues)

TABLE 4 (Continued)

Target	Adapted wording for the port industry
9.2	Promote sustainable industrialization and increase the contribution of the PI to the creation of collective wealth in the communities where port authorities operate
9.4	Modernize port infrastructure and adapt activities to make them more sustainable, through optimal use of resources and increased use of clean and environmentally friendly technologies and industrial processes
9.5	Strengthen scientific research, improve technological capabilities by encouraging innovation in port activities
SDG 10	
10.3	Adopt policies and measures to ensure equal opportunities and eliminate discriminatory practices
SDG 11	
11.2	Promote sustainable employee transportation
11.3	Contribute to sustainable urbanization through active participation in planning and management processes in communities where port authorities are located
11.4	Strengthen efforts to protect and preserve cultural and natural heritage in territories where port authorities operate and in industrial-port areas
11.5	Adapt port infrastructure to prevent natural disasters related to water and climate, contributing to the resilience of communities, in order to reduce the number of people impacted as well as economic losses
11.6	Reduce the negative environmental impact of port and industrial-port activities, including by paying particular attention to air quality and waste management
11.7	Promote access to green spaces and safe spaces for the population
11.a	Promote the establishment of positive economic, social and environmental links between port/industrial-port, urban, peri-urban and rural areas
11.b	Implement risk reduction strategies that promote adaptation to the effects of climate change and resilience to disasters
SDG 12	
12.1	Adopt a policy on sustainable consumption and production patterns
12.2	Promote sustainable management and optimal and circular use of natural resources
12.3	Reduce food waste and food losses along production and supply chains
12.4	Establish a management of chemical substances and hazardous products that is respectful and sustainable for the environment according to the best existing and applicable practices for all substances used as well as the by-products and residues generated throughout their life cycle and reduce spills in air, water and soil, to minimize negative effects on health and the environment
12.5	Reduce waste generation through prevention, reduction, recycling and reuse
12.6	Adopt sustainable practices and publish sustainability performance reports
12.8	Ensure that all employees have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
SDG 13	
13.1	Strengthen the resilience of port infrastructure and adaptive capacities in the face of climatic hazards and climate-related natural disasters
13.2	Integrate climate change measures into policies, strategies and planning
13.3	Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction
SDG 14	
14.1	Prevent and reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
14.2	Contribute to the protection of marine and coastal ecosystems and take action for their restoration in order to achieve healthy and productive oceans
14.3	Reducing ocean acidification and combating its effects, in particular by strengthening scientific cooperation at all levels
14.4	Promote sustainable fishing activities
14.5	Respect marine and coastal areas in accordance with laws and regulations
14.7	Promote the sustainable exploitation of marine resources linked to fishing, aquaculture and tourism where port authorities and industrial-port areas

TABLE 4 (Continued)

Target	Adapted wording for the port industry
14.a	Deepen scientific knowledge, strengthen research capacities and transfer marine techniques, the objective being to improve the health of the oceans and to strengthen the contribution of marine biodiversity to the development of developing countries, in particular small island States in developing and least developed countries
SDG 15	
15.1	Contribute to the restoration, preservation and sustainable use of terrestrial and freshwater ecosystems
15.2	Promote sustainable forest management and the greening of port territories, and contribute to the restoration of degraded forests and increase afforestation and reforestation
15.3	Restore degraded lands and soils
15.5	Reduce the degradation of the natural environment and contribute to the protection of biodiversity, in particular endangered species, avian fauna, migratory birds
15.8	Take measures to prevent the introduction of invasive alien species, mitigate the effects of these species on land and water ecosystems and contribute to the control or eradication of priority species
15.9	Integrate the enhancement of traditional resources and the protection of ecosystems and biodiversity into planning
SDG 16	
16.4	Collaborate with the various agencies and police services to fight against all forms of crime
16.6	Develop effective, accountable and transparent organizations
16.7	Promote participatory management, dynamism and openness
16.10	Guarantee public access to information in compliance with laws and regulations
SDG 17	
17.16	Enhance the partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, knowledge, expertise, technology and financial resources
17.17	Encourage and promote public, public-private and civil society partnerships

6 (Clean water and sanitation), 7 (Affordable and clean energy), 11 (Sustainable cities and communities) and, 13 (Climate action) which concern issues more specific to the PI.

Wang et al. (2020) also determined that the least relevant SDGs for the maritime industry are SDGs 1 (No poverty), 2 (Zero Hunger), 3 (Good health and well-being), 4 (Quality Education), 5 (Gender equality), 6 (Clean water and sanitation), 10 (Reduced inequalities) and 15 (Life on land). These SDGs are the ones to which the sustainability reports they analyzed gave the least content. Once again, these results are similar to those of the 69-target framework with two notable exceptions: SDGs 6 and 15. The specific issues of port authorities (on land) and the maritime industry (mainly off land) explain these small differences.

Caliskan (2022) carried out a qualitative content analysis and identified SDGs where the PI has the potential to contribute. Again, this study was at the SDG level. It reveals that SDGs 8 (Decent work and economic growth), 9 (Industry, innovation and infrastructure), 11 (Sustainable cities and communities), 12 (Responsible consumption and production), 13 (Climate action) and 17 (Partnerships for the goals) are those with the highest potential. The least mentioned SDGs are Gender equality (SDG 5), Zero hunger (SDG 2) and No poverty (SDG 1). These results do not differ from those of the 69-target framework with the exception of SDG 17 (Partnership for the goals).

The results of the research enhance the previous ones. The approach by the SDG targets used in this research is more accurate. It allows to address a set of issues, which could escape an analysis carried out at the SDG level, and to remove those, which are not relevant for the PI.

The analysis of the coverage of the SDGs does not aim to prioritize them. Indeed, it would be wrong to claim that some SDGs are not important. If fewer issues are linked to a SDG, it does not diminish its importance. In this sense, it is pernicious to only consider certain SDGs since this ends up rejecting a non-negligible number of targets relevant to the PI. In addition, the implementation of a sustainability strategy should be done in a systemic and integrated approach that considers the interactions between the targets of the SDGs. The synergistic or trade-off relationships can guide action to maximize synergies or reduce trade-offs.

4.3 | Implications for further work

It is important to mention that the number of reference frameworks that consider a SDG target (Table 3) is not related to its importance. In fact, each port authority must prioritize the targets according to its challenges and its context via a planning process that includes the

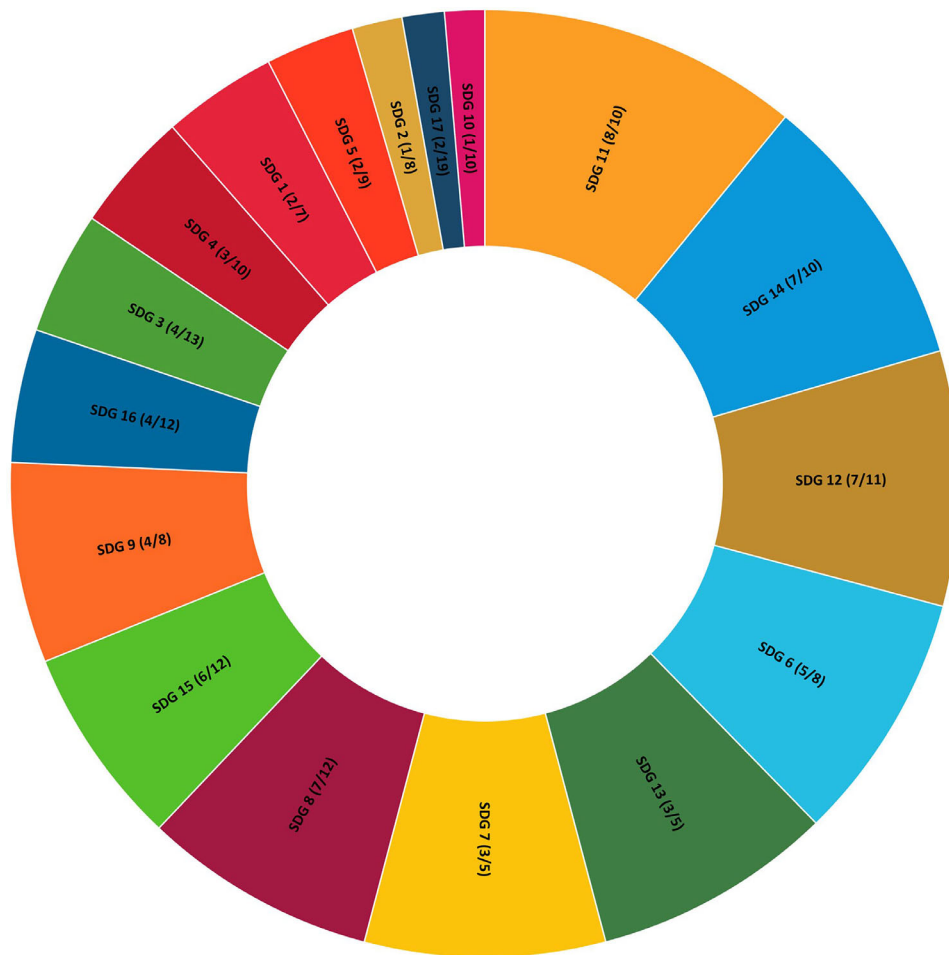


FIGURE 3 Proportion of relevant targets by SDG aligned with the port industry.

assessment of different parameters (Alamouh et al., 2021; Grainger-Brown & Malekpour, 2019). In this sense, the next step of our work consists in adapting a SDG target prioritization grid (Organisation internationale de la Francophonie, Institut de la Francophonie pour le Développement Durable, Global Shift Institute, & Chaire en éco-conseil de l'Université du Québec à Chicoutimi, 2018; Tremblay et al., 2021) to the PI. This grid will be constructed by integrating the wording of the SDG targets adapted to the PI. The methodology of this grid is based on the assessment of three parameters:

1. Performance: the current level of achievement of a target?
2. Importance: Given the specific context of a port authority, what is the significance level of a target?
3. Governance: To which level of governance (local, national, private) the powers and responsibilities for a target is assigned?

The crossing of the assessment of the first two parameters generates a priority index for a specific port authority. The grid will include the 169 SDG targets but only the 69 targets deemed relevant by the PI will have an adapted wording. When contextualizing the 69-target framework in a port authority, it may not be the 69 targets that are relevant. It is also possible that targets not included in the 69 are relevant. Finally, the framework can be applied to all port authorities,

regardless of their level of progress in the implementation of sustainable development.

In the end, this work of identifying relevant SDG targets and their adaptation paves the way for the development of a tool adapted to the PI. This tool will help port authorities in their implementation of sustainable development by considering the SDGs at the target level and the three dimensions of sustainable development. This reference framework can be used by port authorities around the world. Port industry managers can use it to perform materiality assessment, develop sustainability strategies, provide reporting aligned with the SDGs and communicate their contribution to achieving the national SDGs.

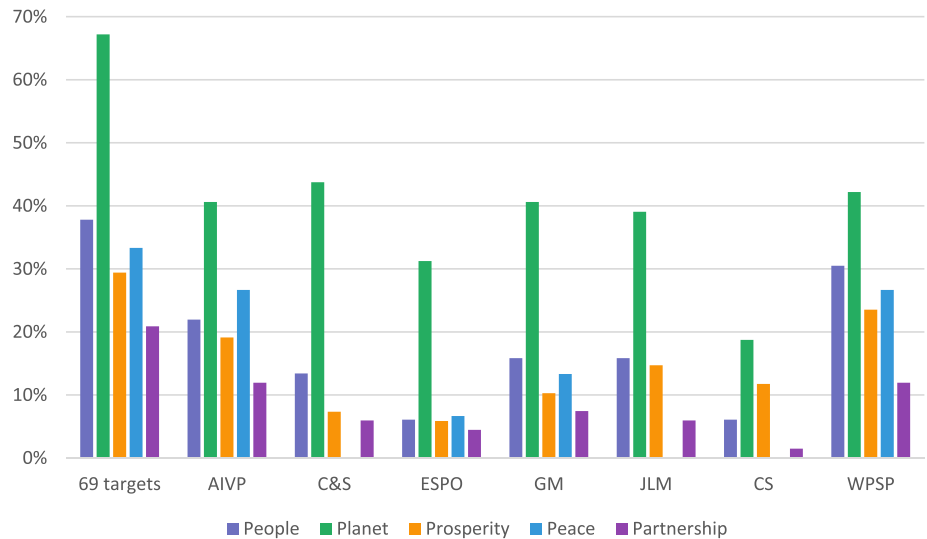
5 | CONCLUSION

This research relies on best practices for localizing the SDGs and includes the concepts of contextualization and adaptation. The focus of this paper was to address the question: how the SDG targets align with the PI? The methodology applied has the particularity of being at the SDG target level. The target level is both more complex and more precise than the generic SDG level to ensure concrete implementation of sustainability, SDG targets being action-oriented. The approach

TABLE 5 Classification of the SDGs according to the five pillars of the 2030 Agenda and percentage coverage of the 69 targets relevant to the port industry.

SDG	People	Planet	Prosperity	Peace	Partnership	% coverage
SDG 11	X	X			X	80%
SDG 14		X				70%
SDG 12		X				64%
SDG 6	X	X				63%
SDG 7		X	X			60%
SDG 13	X	X				60%
SDG 8	X		X			58%
SDG 9			X			50%
SDG 15		X				50%
SDG 16	X			X	X	33%
SDG 3	X					31%
SDG 4	X					30%
SDG 1	X		X			29%
SDG 5	X					22%
SDG 2	X	X	X			13%
SDG 17			X	X	X	11%
SDG 10	X		X	X	X	10%

FIGURE 4 Percentage of targets considered in the five pillars of the 2030 Agenda according to the classification of Tremblay et al. (2020). The reference documents on the x-axis: International Association of Ports and Cities (AIVP), Comtois and Slack (C&S), European Sea Ports Organization (ESPO), Green Marine (GM), MacNeil, Jennifer L. (JLM), Schipper, Cor (CS), World Ports Sustainability Program (WPSP); details on these documents are presented in Table 1.



used made it possible to identify 69 targets from the 2030 Agenda which are relevant for the PI. The wordings of these 69 targets were adapted to make them meaningful for the PI internal and external stakeholders. Furthermore, the 69-target framework integrates the three dimensions of SD, thus enhancing the port sustainability reference frameworks, which often focus exclusively on the environmental dimension of sustainability identified as a knowledge gap.

Arising from a diversity of Canadian Port Authorities, the results of this research apply to the PI but the process can be repeated for any other economic sector or activity. It provides a procedure that allows a localization of the SDG targets in the PI and a methodology to address a lack of knowledge on the implementation of the SDGs in

the private sector. The 69-target framework developed here addresses the PI globally even if it has been validated by Canadian experts. The 69-target framework can help ports around the world to integrate the SDGs into their own sustainable development strategy. This contextualized framework will promote the mobilization of ports since the adapted wordings allow a better understanding of the issues related to the SDG targets relevant to the PI. However, each specific use in a particular port authority must be further contextualized, because the issues and opportunities differ from one port to another even in the same country. Thus, our approach sets the stage for the development of tools to facilitate the application of the reference framework. The approach developed in this study could also be used

to develop reference frameworks for the 2030 Agenda adapted for other sectors of economic activity.

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CONFLICT OF INTEREST STATEMENT

We have no conflicts of interest to disclose.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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