

Table 1. Comparison of information sought from ballast water reporting forms as required by IMO (<http://www.imo.org>) India (<http://www.bw-mindia.com/node/3>), Canada (<http://www.tc.gc.ca/media/documents/marinesafety/schedule6e.pdf>), USA (<https://invasions.si.edu/nbic/forms/-BallastWaterForm.pdf>), and Australia (<http://www.agriculture.gov.au/biosecurity/avm/vessels/>).

Standard Features	IMO BWRF	India BWRF	Canada BWRF	United States BWRF	Australia BWRF
Ship Name	✓	✓	✓	✓	✓
Type	✓	✓	✓	✓	
IMO Number	✓	✓	✓	✓	✓
Owner	✓	✓	✓	✓	
Gross Tonnage	✓	✓	✓	✓	
Call Sign	✓	✓		✓	✓
Flag	✓	✓	✓	✓	
Arrival Date	✓	✓	✓	✓	✓
Agent	✓	✓	✓	✓	
Last Port	✓	✓	✓	✓	
Last Country	✓	✓	✓	✓	
Next Port	✓	✓	✓	✓	
Next Country	✓	✓	✓	✓	
Arrival Port	✓	✓	✓	✓	
Specific Units	✓	✓	✓	✓	✓
Total Ballast Water on Board	✓	✓	✓	✓	
Total Ballast Water Capacity	✓	✓	✓	✓	
Ballast Management Plan on board?	✓	✓	✓	✓	
Management Plan implemented?	✓	✓	✓	✓	
Total Number of Tanks on Board	✓	✓	✓	✓	
Number of Tanks in Ballast	✓	✓	✓	✓	
Total No. of Tanks Exchanged	✓	✓	✓	✓	
Total No. of Tanks not Exchanged	✓	✓	✓	✓	
Tanks / Holds (BW Source)	✓	✓	✓	✓	✓
Date (BW Source)	✓	✓	✓	✓	✓
Port or latitude/longitude (BW Source)	✓	✓	✓	✓	✓
Volume (BW Source)	✓	✓	✓	✓	✓
Temp (BW Source)	✓	✓		✓	
Date (BW Exchange)	✓	✓		✓	✓
Endpoint or latitude/longitude (BW Exchange)	✓	✓	✓	✓	✓
Volume (BW Exchange)	✓	✓	✓	✓	✓
% Exchange (BW Exchange)	✓	✓	✓	✓	✓
Method (BW Exchange)	✓	✓	✓	✓	✓
Sea Ht. (m) (BW Exchange)	✓	✓		✓	✓
Date (BW Discharge)	✓	✓	✓	✓	✓
Port or latitude/longitude (BW Discharge)	✓	✓	✓	✓	✓
Volume (BW Discharge)	✓	✓	✓	✓	✓
Salinity (BW Discharge)	✓	✓	✓	✓	
Resolution A 868(20)	✓	✓	✓	✓	
Responsible officers name	✓	✓	✓	✓	✓
Remarks	✓	✓	✓	✓	✓

2. WHY IS REPORTING IMPORTANT?

Ballast water reporting is important as it will give prior information to the receiving port as to which ship will be coming to their port, what is the IMO number, from where the ship has come, etc. It will also give information on ballast water, such as how much ballast water the ship is carrying in each tank and what is the total capacity of the ship. Further it will provide information on whether there has been ballast water exchange, if so where the exchange took place, which tanks were exchanged and the quantity of ballast water exchanged.

3. HOW REPORTING IS DONE TODAY

The ballast water reporting form as per the IMO Res. 868(20) is shown in Figure 1. The form requires information about the vessel, ballast water on board, ballast water capacity, and history of ballast water (INTERTANKO, 2000). This form is filled by the first or the second officer and signed by the Chief Officer of the ship and is handed over at the port of arrival.

4. DIFFERENT KINDS OF BALLAST WATER REPORTING FORMS

It is not mandatory to submit the form till the convention is in force. However many port states have made it mandatory and have come up with their own BWRFs. A comparison of information in BWRFs sought from different countries (India, Canada, United States and Australia) with the BWRF of IMO is shown in Table 1. Additional information sought by individual countries like Canada, United States and Australia which are not mentioned in IMO BWRF is shown in Table 2.

BWRFs play a critical role in collating data regarding ballast water discharge or uptake at any given port and serves to overcome the limitations of manually submitted reporting forms. Hence India has chosen to develop a self-validating Electronic Ballast Water Reporting Form (e-BWRF). e-BWRF is being implemented on a voluntary basis at major ports of India.

Data was collated from ballast water reporting forms (IMO Paper forms, 1225) submitted by ships. In this case study, 242 forms had different types of errors as indicated

Table 2. Additional information sought in Ballast Water Reporting Forms (BWRF) by Canada and Australia.

Standard Features	Canada BWRF	Australia BWRF
Date of submission	✓	
Next Port (2)	✓	
Next Country (2)	✓	
Next Port (3)	✓	
Next Country (3)	✓	
Total number of ballast water tanks to be discharged	✓	
Salinity (Source)	✓	
Start Point Lat. & Long	✓	
Wave height		✓
Year built		✓
Instruction for exchange		✓
Pump details for exchange		

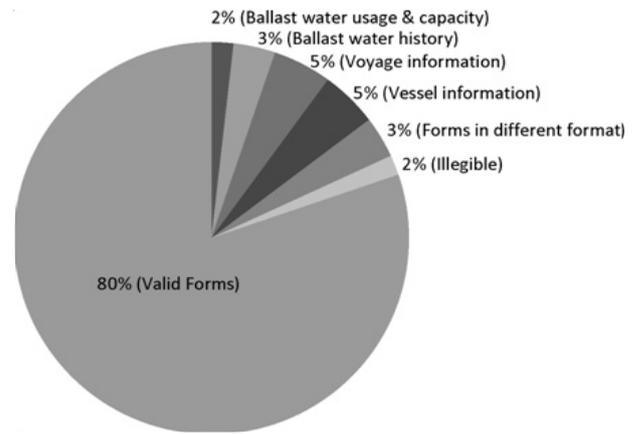


Figure 2. Percentage of ballast water reporting forms (paper) in case study (1) with & without errors.

Table 3. Scrutiny report of Ballast Water Reporting Forms (Paper).

Error type	Number of forms
Ballast water usage & capacity not provided	22
Ballast water history not provided	42
Voyage information unclear	59
Vessel information not provided	57
Forms in different format	42
Illegible	20
Total number of forms with errors	242
Valid Forms	983
Total No. of forms collected	1225

Table 4. Scrutiny report of Ballast Water Reporting Forms (Paper).

Error type	Number of forms
Ballast water usage & capacity not provided	704
Ballast water history not provided	543
Voyage information unclear	99
Vessel information not provided	93
Forms in different format	20
Illegible	12
Total number of forms with errors	1471
Valid Forms	454
Total No. of forms collected	1925

in Table 3 and Figure 2. In a second case study, 1925 paper forms were evaluated. Of the 1925 paper forms examined, only 454 forms were found valid and the rest (1471) were considered as invalid (76%) due to various errors as indicated in Table 4 and Figure 3.

Since the e-BWRF are self-validating, all of these forms can be utilized in the risk assessment database. In this context, the e-BWRF has many simple value-added features which make submission of reporting form easy and is available on the website <http://www.bwmindia.com>.

5. FUTURE SCENARIO - HOW REPORTING CAN BE DONE IN THE FUTURE

The existing Ballast Water Reporting form caters mostly to the requirements of D-1 standards of the IMO BW convention. It is pertinent to note that there will be

treatment technologies fitted on board progressively to meet D-2 standards of the IMO convention and also referred to as Performance Standard (Lauridsen & Overgaard 2016). In view of this, it would be important for the port state control to have advance information of (a) the treatment technology or ballast water management system employed on the vessel, (b) the approving administration of such a system and (c) details of the treatment measures carried out.

In another scenario it is also possible to have risk based exemption as provided in the convention and that would to a certain extent be dependent on a commonality of the diversity of organisms at the source and discharge ports, oceanographic features and risk assessment.

In view of this it is essential to look at the designing of BWRFs that add information on the treatment technology and/or the risk assessment based exemptions.

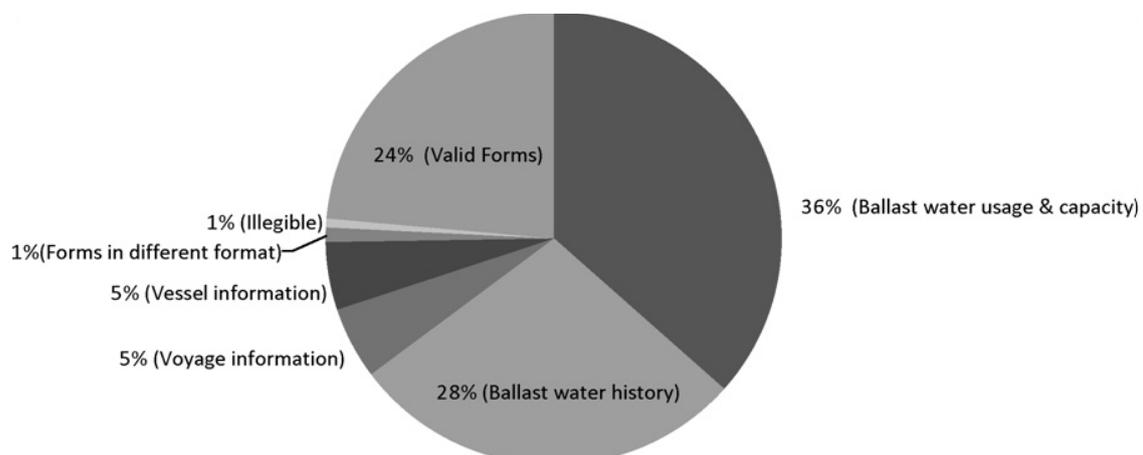


Figure 3. Percentage of ballast water reporting forms (paper) in case study (2) with & without errors.

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