MARINE MAINTENANCE IN THE ZONES – A GLOBAL COMPARISON OF REPAIR COMMENCEMENT TIMES

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Abstract: Many factors can impact the time it takes to commence a submarine cable repair: permits, transits, vessel availability, weather, spares availability and security requirements to name just a few. This paper takes available repair durations spanning several years from across all of the World's maintenance zones (ACMA, MECMA, SEAIOCMA, YZ & NAZ) to compare and contrast the mean time to repair by region. In addition, the underlying reasons for the widely varying timescales are explored, and common themes identified.

The findings of this paper shed light on the geopolitical issues impacting the expeditious repair of submarine cables, which may have profound economic consequences for carriers and end-users alike in the countries and regions affected. Whilst no attempt is made here to suggest solutions, by presenting quantified regional differences in mean time to repair we aim to provide a global overview of what has become a significant issue for international carriers.

1. INTRODUCTION

Verizon and SingTel have ownership stakes in cables spanning all five of the World's marine maintenance Zones. As a member of a Cable Maintenance Agreement (CMA), oversight is provided of all vessel activities within that Zone in the form of repair commencement and completion notifications. Working together, Verizon and SingTel have collated all these notifications spanning a period of five years for the Atlantic Cable Maintenance Agreement (ACMA), Mediterranean Cable Maintenance Agreement (MECMA), the Yokohama Zone (YZ) and the North America Zone (NAZ) and for two years in the South East Asia & Indian Ocean Cable Maintenance Agreement (SEAIOCMA). The geographic extent of each Zone is shown in Figure 1.

The objective was to analyse the repair data by country and region to observe geographic trends in the time taken to commence repairs. Using commentary provided by the Zone's Ship Operators, the cause of any delay could be understood and quantified.

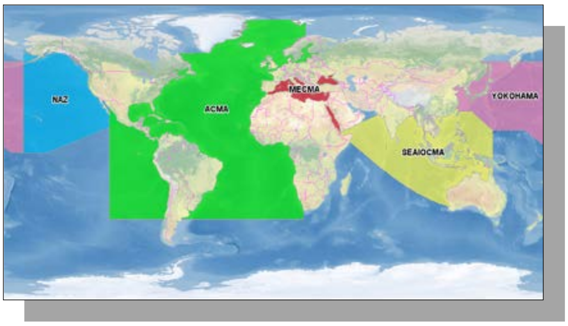

Figure 1. Map of Maintenance Zones (courtesy Global Marine Systems Ltd (GMSL))

Repair permit requirements vary significantly from country to country and from Territorial Waters (TW, 0-12 nautical miles offshore) to Exclusive Economic Zones (EEZ, 12 to 200 nautical miles offshore). The International Cable Protection Committee (ICPC) has recognised the widely varying permit requirements and is campaigning to encourage all countries to offer notification only arrangements or at least fast-track permit processing in the interests of avoiding unnecessarily long traffic outages. The analysis carried out aims to show quantitatively which regions have the best regulatory processes in place.

Factors other than permits can also cause significant delays to repairs, and these vary from a single man-made or geological event causing multiple outages across several cables to the ship being engaged on previous repairs. The data shows how each of these factors presents different challenges in particular maintenance Zones. It also differentiates between factors which cannot be foreseen and managed versus those that can.

2. METHODOLOGY

471 Zone commencement and completion notifications were collated comprising:

- 186 repairs in ACMA (2008-2012)
- 115 repairs in MECMA (2008-2012)
- 93 repairs in YZ (2008-2012)
- 68 repairs in SEAIOCMA (2010-2011)
- 9 repairs in NAZ (2008-2012)

From these notifications the following data was extracted:

- Notified Date & Time
- Departure Date & Time
- Ground Arrival Date/Time
- Sailing From
- Fault Type

From the above data, it was possible to calculate the interval times between notification, departure and arrival at the repair grounds for each repair. The transit distance to the repair ground was estimated and using a map of Maritime Boundaries and the Global Marine Cables Database the jurisdiction (country) and waters (TW/EEZ) at the repair ground was estimated.

This dataset was then corroborated by the Zone Ship Operators who added commentary on the cause of any delay. Causes varied significantly but could be categorised as follows:

- Multiple outages (e.g.: an earthquake event)
- Ship engaged on prior repair
- Permit delay
- Operational (e.g.: awaiting a rep, MA opted to postpone)
- Unspecified delay
- No delay (vessel sailed within 24hrs of notification).

The data analysis was performed by creating sub-sets by Zone and jurisdiction. Within each sub-set statistics were performed to calculate:

- Mean time to departure
- Mean transit time
- Mean time to commencement (sum of the above two)
- Percentage attributable to each category of repair
- Total number of repairs in TW & EEZ

The results are presented as a series of graphs and a colour coded map created to summarise the mean-time to departure within each jurisdiction (zero to five days coloured green, five to ten days amber, and over ten days red).

3. RESULTS

Analysis of the results show a large spread in the number of repairs over the analysed period per jurisdiction ranging from around 70 in the waters off mainland China to single events off other countries (see Figure 2). Clearly the jurisdictions with the larger number of repairs represent those most likely with repeated patterns and causes of cable failures.

Shunt faults accounted for 25% of the 233 repairs for which fault type data was given.

Within the overall totals, the assessment of split between TW and EEZ indicates some countries with a higher proportion of faults in TW than others with a higher overall total. Examples include Italy, Libya and Greece, the number of repairs of the latter clearly influenced by the archipelagic nature of its coastline and surrounding shallow waters. A greater number of faults in TWs can only likely lead to a higher delay in repair commencement times as stricter permitting regimes (as compared to the EEZ) must be presumed.

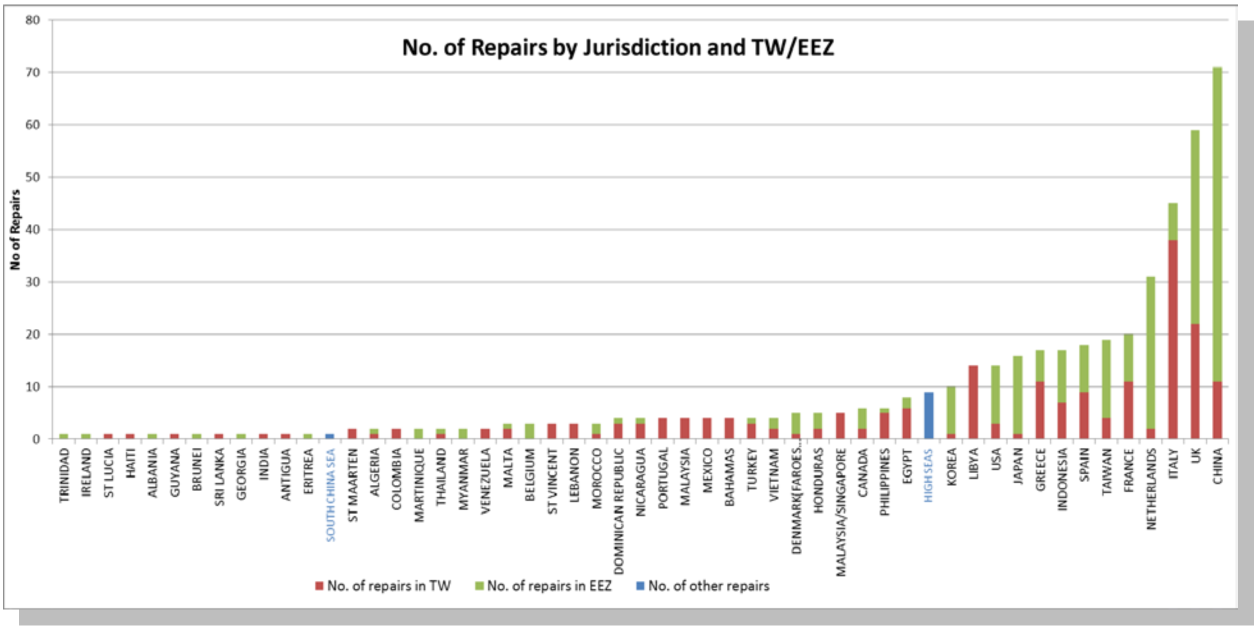

Figure 2: Number of repairs by jurisdiction and TW/EEZ.

Analysis of the data by jurisdiction indicates that whilst the greater number of faults (from Figure 2) may be in countries in the European region (with the obvious exception of China), the countries with the greatest notified to departure time, on average, are mostly in the AsiaPac region (see Figure 3). [In order to compute average notified to departure and cable ground times by jurisdiction, countries with single events in the dataset were excluded for the purpose of the analysis].

In order to exclude the influence of transit times, which were computed using the times indicated on Completion Notices, and refined where appropriate by the Zone ship Operators, transit time was separated out and is also indicated on Figure 3. It is still possible to see however that the greatest proportion of time to repair commencement in most of these cases was not due to transit times, and therefore delays must be caused by other factors. In order to then further distinguish between these delaying factors, all the records were categorised by type.

Figure 4 demonstrates the split of delay type in the same order as overall time to repair commencement. From this figure, it can be seen that, for example whilst Indonesia may have the highest time to repair, one of the largest contributing factors is permit delays (an issue recognised by the industry, and by ICPC and currently one that it is hoped is being addressed with a view toward dramatically reducing permit times or changing to a notification system). Note also that the second highest cause for delay in Indonesia is prior repairs – a likely scenario if repairs are getting backed up by delays, such as permits). This cascading effect can be largely eliminated by a notification only or rapid repair permit system.

From Figure 4, it is also possible to determine how, for example, permitting delays are a highly influencing feature of repair commencement times in countries such as China and Italy whilst at the same time not being a factor at all in countries such as the UK where no repair permits are required, but where delays are more likely due to repairs, given the number of faults being encountered.

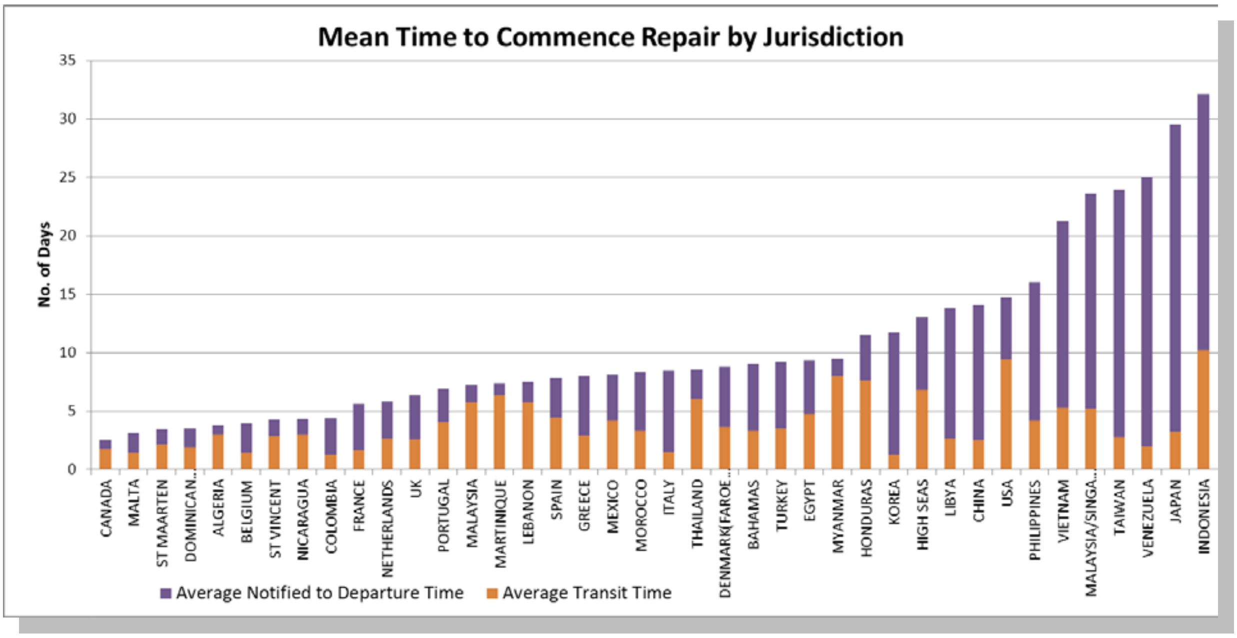

Figure 3: Mean time to commence repair by jurisdiction (where fault count exceeds 1).

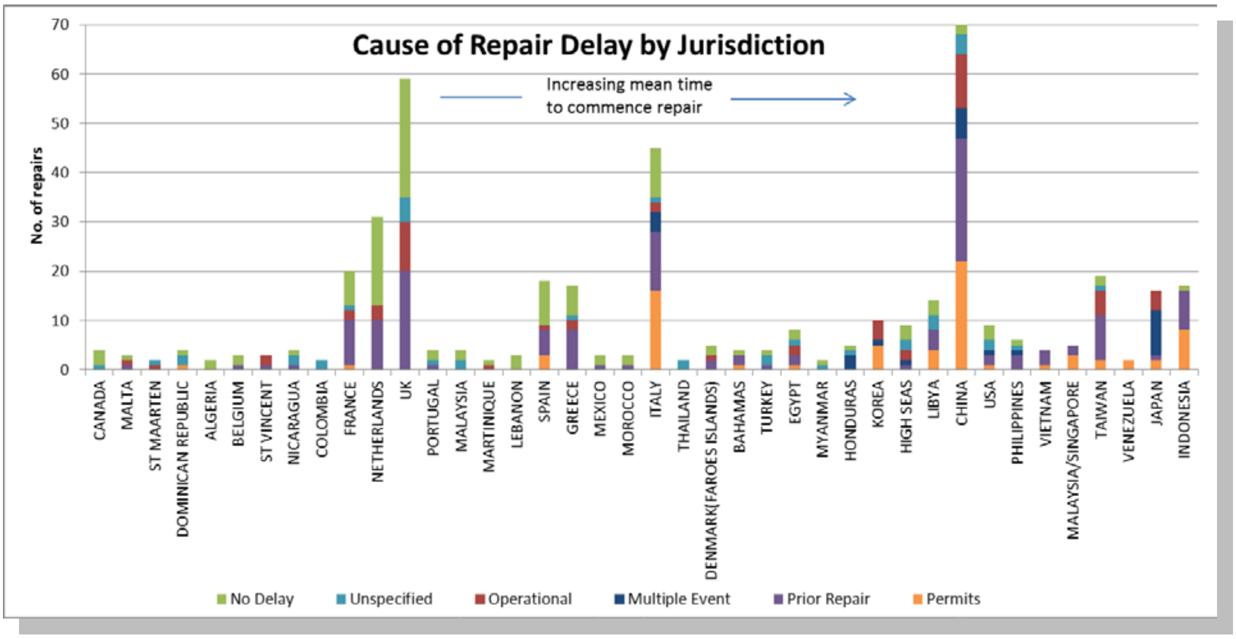

Figure 4: Cause of Delay by Jurisdiction (defined as >24hrs between notification and departure).

Figure 4 also demonstrates that whilst a country such as Japan has, on average, a longer period to repair commencement, this is mainly due to external influences from multiple events, such as earthquake activity, a feature that is, unfortunately, only to be expected following recent events in this region. Finally, Figure 4 helps indicate the countries where no delays are more likely, and it would appear these are mostly in the European region, with Italy for example - despite having a high number of faults, and a high number with delays - still having a reasonable number not delayed by any other factor.

An alternate presentation of the data, by delay type by Zone demonstrates how each factor has a varying influence between each Zone (see Figures 5 & 6). For example, and as is to be expected, multiple events have historically been a large contributing factor in the YZ, and less so in other Zones. Such events clearly have a knock-on effect to subsequent operations and vessel availability. Permitting delays appear to be a bigger issue in the YZ, SEAIOCMA and MECMA than ACMA, whilst the greater number of repairs with no delay to commencement times appear to be located in the ACMA region (and to some extent in the NAZ region, although the low number of faults – a good feature - in this geographic area do influence this dataset).

A final presentation, geographically presents each country/region's notified to departure time colour coded (see Figure 7). Whilst all of the contributing factors previously discussed need to be viewed in the context of this map, it is however clear to see that broadly speaking, the AsiaPac region does represent the biggest challenge to repair commencement times and these challenges are country rather than zone specific.

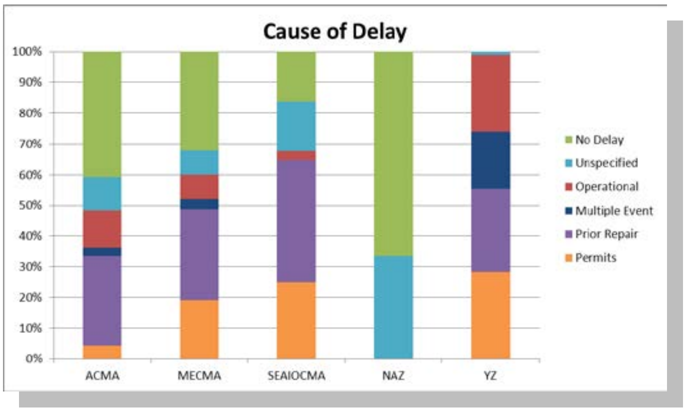

Figure 5: Cause of delay as a percentage of the total number of repairs in each Zone

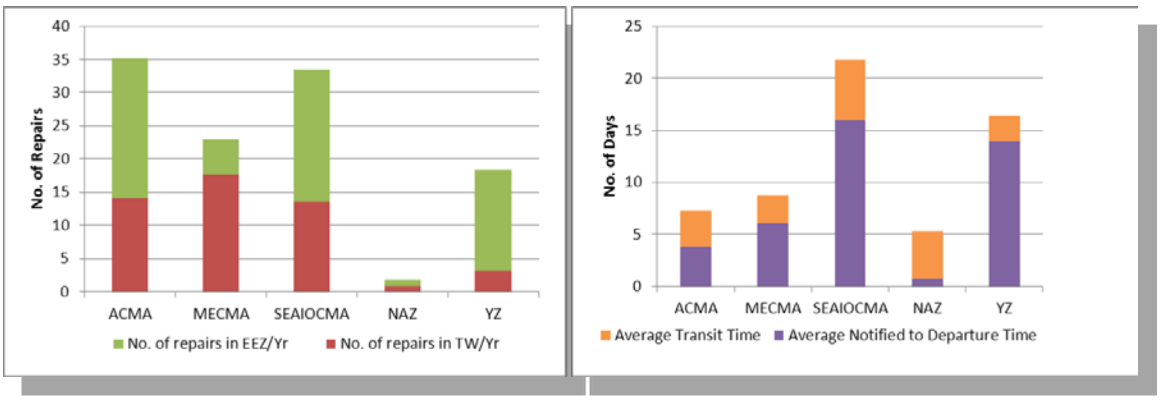

Figure 6: Breakdown of annualised repair numbers and repair timings by Zone

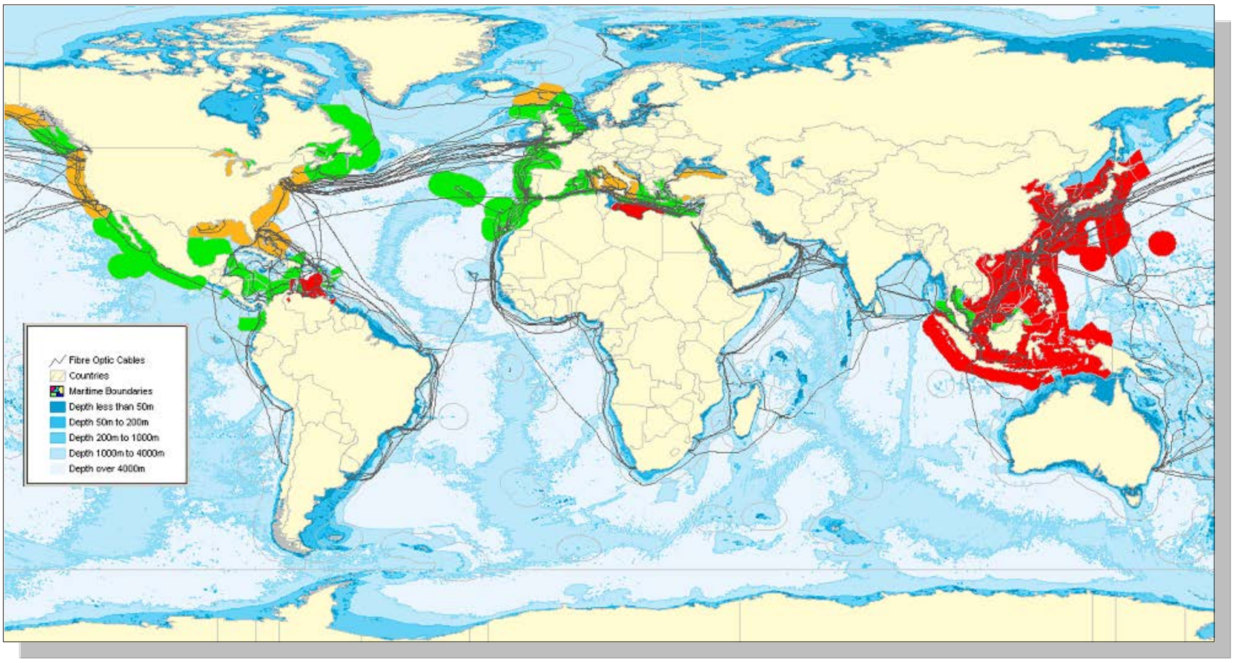

Figure 7: Coloured coded map showing mean notified to departure time for each jurisdiction. Green = < 5 days, Orange = 5-10 days, Red = >10 days.

4. CONCLUSIONS

This study has illustrated quantifiably and geographically the regional differences in mean time to commence repairs. Furthermore, the reasons for these differences has been explored and explained. AsiaPac stands out as taking longer to commence repairs, and part of this is a result of long permit durations (e.g., Indonesia), and part is a result of the frequency distribution of cable faults (e.g., Japan). Having quantified the delays which can potentially be managed out of the repair process it is hoped this work will prompt action by the respective Carriers and national governments to seek improvements which will facilitate the expeditious repair of submarine cables worldwide.

It is recommended that any further studies should include the fault time (as many of the operations included in this dataset will have been pre-permitted), whilst data from private maintenance agreements would also supplement the analysis.

5. ACKNOWLEDGEMENTS

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