Puerto Rico contains three major seaports. They are San Juan Port, the Port of San Juan, and the Port of Ponce. In 2017, these ports were disrupted by the wind and waves Hurricane Maria brought to the coast of Puerto Rico. Hurricane Maria devastated the island and its 3.4 million residents. The ports along the coasts of the island suffered severe damage from the rising sea-levels and strong winds making landfill over them.

The performance of maritime transportation systems struggle to remain reliable and resilient during times of disruption. Major disruptions at a port may result from external threats such as storms, terrorist, labor disputes, and oil or hazardous material spills as well as multiple catastrophic events.

The extent of the disruption and damage to a port, and the duration of the disruption depend on the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port is defined in terms of the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port can be defined as the ability of the port to recover from a disruptive event that results in a decrease in port performance.

For this study, vessel location information from onboard AIS transceivers will be used to generate average vessel dwell time within the port area of interest and net vessel transit time in and out of the port areas of interest. Dwell time is the continuous length of time a vessel spends within the port area or associated regions such as offshore anchorages [1]. This indicates the capability of the port to efficiently handle cargo flows at the terminals and beyond [2]. During a disruptive event, there is a decrease in port performance. Vessels are processed at a slower rate, causing an increase in overall dwell time in the area surrounding the port. The ability of ports to recover from a disruptive event determines their level of resilience.

The contribution of this research is to empirically show how port clusters interact with each other during disruptive events to increase the overall resiliency of water borne commerce. The disruptions caused by Hurricane Maria in Puerto Rico, had both short-term and long-term impacts to the affected region. In the short-term, Puerto Rico experienced an inability for freight vessel to access any one of the three ports on the island territory, delaying in and out of Puerto Rico traffic. Long-term, the economic impact and the recovery process of this region will likely be affected by the devastating storm.

The performance of maritime transportation systems struggle to remain reliable and resilient during times of disruption. Major disruptions at a port may result from external threats such as storms, terrorist, labor disputes, and oil or hazardous material spills as well as multiple catastrophic events.

The extent of the disruption and damage to a port, and the duration of the disruption depend on the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port is defined in terms of the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port can be defined as the ability of the port to recover from a disruptive event that results in a decrease in port performance.

For this study, vessel location information from onboard AIS transceivers will be used to generate average vessel dwell time within the port area of interest and net vessel transit time in and out of the port areas of interest. Dwell time is the continuous length of time a vessel spends within the port area or associated regions such as offshore anchorages [1]. This indicates the capability of the port to efficiently handle cargo flows at the terminals and beyond [2]. During a disruptive event, there is a decrease in port performance. Vessels are processed at a slower rate, causing an increase in overall dwell time in the area surrounding the port. The ability of ports to recover from a disruptive event determines their level of resilience.

The contribution of this research is to empirically show how port clusters interact with each other during disruptive events to increase the overall resiliency of water borne commerce. The disruptions caused by Hurricane Maria in Puerto Rico, had both short-term and long-term impacts to the affected region. In the short-term, Puerto Rico experienced an inability for freight vessel to access any one of the three ports on the island territory, delaying in and out of Puerto Rico traffic. Long-term, the economic impact and the recovery process of this region will likely be affected by the devastating storm.

The performance of maritime transportation systems struggle to remain reliable and resilient during times of disruption. Major disruptions at a port may result from external threats such as storms, terrorist, labor disputes, and oil or hazardous material spills as well as multiple catastrophic events.

The extent of the disruption and damage to a port, and the duration of the disruption depend on the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port is defined in terms of the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port can be defined as the ability of the port to recover from a disruptive event that results in a decrease in port performance.

For this study, vessel location information from onboard AIS transceivers will be used to generate average vessel dwell time within the port area of interest and net vessel transit time in and out of the port areas of interest. Dwell time is the continuous length of time a vessel spends within the port area or associated regions such as offshore anchorages [1]. This indicates the capability of the port to efficiently handle cargo flows at the terminals and beyond [2]. During a disruptive event, there is a decrease in port performance. Vessels are processed at a slower rate, causing an increase in overall dwell time in the area surrounding the port. The ability of ports to recover from a disruptive event determines their level of resilience.

The contribution of this research is to empirically show how port clusters interact with each other during disruptive events to increase the overall resiliency of water borne commerce. The disruptions caused by Hurricane Maria in Puerto Rico, had both short-term and long-term impacts to the affected region. In the short-term, Puerto Rico experienced an inability for freight vessel to access any one of the three ports on the island territory, delaying in and out of Puerto Rico traffic. Long-term, the economic impact and the recovery process of this region will likely be affected by the devastating storm.

The performance of maritime transportation systems struggle to remain reliable and resilient during times of disruption. Major disruptions at a port may result from external threats such as storms, terrorist, labor disputes, and oil or hazardous material spills as well as multiple catastrophic events.

The extent of the disruption and damage to a port, and the duration of the disruption depend on the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port is defined in terms of the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port can be defined as the ability of the port to recover from a disruptive event that results in a decrease in port performance.

For this study, vessel location information from onboard AIS transceivers will be used to generate average vessel dwell time within the port area of interest and net vessel transit time in and out of the port areas of interest. Dwell time is the continuous length of time a vessel spends within the port area or associated regions such as offshore anchorages [1]. This indicates the capability of the port to efficiently handle cargo flows at the terminals and beyond [2]. During a disruptive event, there is a decrease in port performance. Vessels are processed at a slower rate, causing an increase in overall dwell time in the area surrounding the port. The ability of ports to recover from a disruptive event determines their level of resilience.

The performance of maritime transportation systems struggle to remain reliable and resilient during times of disruption. Major disruptions at a port may result from external threats such as storms, terrorist, labor disputes, and oil or hazardous material spills as well as multiple catastrophic events.

The extent of the disruption and damage to a port, and the duration of the disruption depend on the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port is defined in terms of the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port can be defined as the ability of the port to recover from a disruptive event that results in a decrease in port performance.

For this study, vessel location information from onboard AIS transceivers will be used to generate average vessel dwell time within the port area of interest and net vessel transit time in and out of the port areas of interest. Dwell time is the continuous length of time a vessel spends within the port area or associated regions such as offshore anchorages [1]. This indicates the capability of the port to efficiently handle cargo flows at the terminals and beyond [2]. During a disruptive event, there is a decrease in port performance. Vessels are processed at a slower rate, causing an increase in overall dwell time in the area surrounding the port. The ability of ports to recover from a disruptive event determines their level of resilience.

The performance of maritime transportation systems struggle to remain reliable and resilient during times of disruption. Major disruptions at a port may result from external threats such as storms, terrorist, labor disputes, and oil or hazardous material spills as well as multiple catastrophic events.

The extent of the disruption and damage to a port, and the duration of the disruption depend on the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port is defined in terms of the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port can be defined as the ability of the port to recover from a disruptive event that results in a decrease in port performance.

For this study, vessel location information from onboard AIS transceivers will be used to generate average vessel dwell time within the port area of interest and net vessel transit time in and out of the port areas of interest. Dwell time is the continuous length of time a vessel spends within the port area or associated regions such as offshore anchorages [1]. This indicates the capability of the port to efficiently handle cargo flows at the terminals and beyond [2]. During a disruptive event, there is a decrease in port performance. Vessels are processed at a slower rate, causing an increase in overall dwell time in the area surrounding the port. The ability of ports to recover from a disruptive event determines their level of resilience.

The performance of maritime transportation systems struggle to remain reliable and resilient during times of disruption. Major disruptions at a port may result from external threats such as storms, terrorist, labor disputes, and oil or hazardous material spills as well as multiple catastrophic events.

The extent of the disruption and damage to a port, and the duration of the disruption depend on the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port is defined in terms of the severity of the threat, the degree to which the port is vulnerable to it, and the decisions that are made in response to the disruption. Resilience of a port can be defined as the ability of the port to recover from a disruptive event that results in a decrease in port performance.

For this study, vessel location information from onboard AIS transceivers will be used to generate average vessel dwell time within the port area of interest and net vessel transit time in and out of the port areas of interest. Dwell time is the continuous length of time a vessel spends within the port area or associated regions such as offshore anchorages [1]. This indicates the capability of the port to efficiently handle cargo flows at the terminals and beyond [2]. During a disruptive event, there is a decrease in port performance. Vessels are processed at a slower rate, causing an increase in overall dwell time in the area surrounding the port. The ability of ports to recover from a disruptive event determines their level of resilience.