

Offshore Wind Industry

Supply Chain and Localization – The Potential & Opportunities



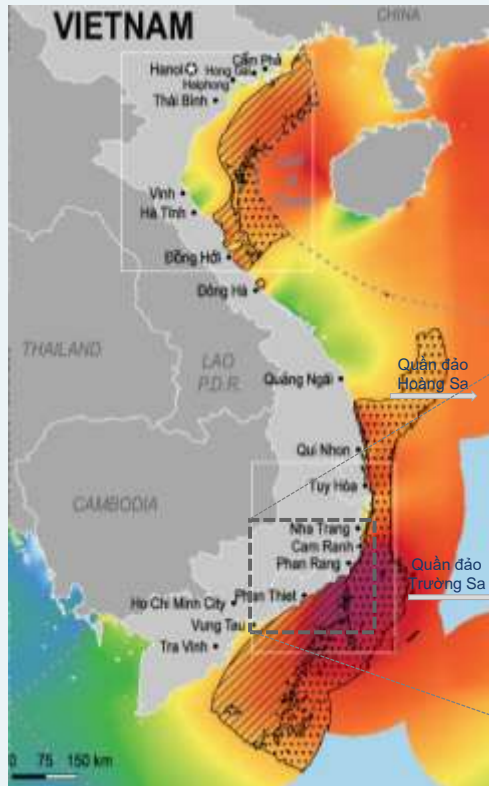
Tran Xuan Bach, Localization Manager of COP Vietnam
August 2023



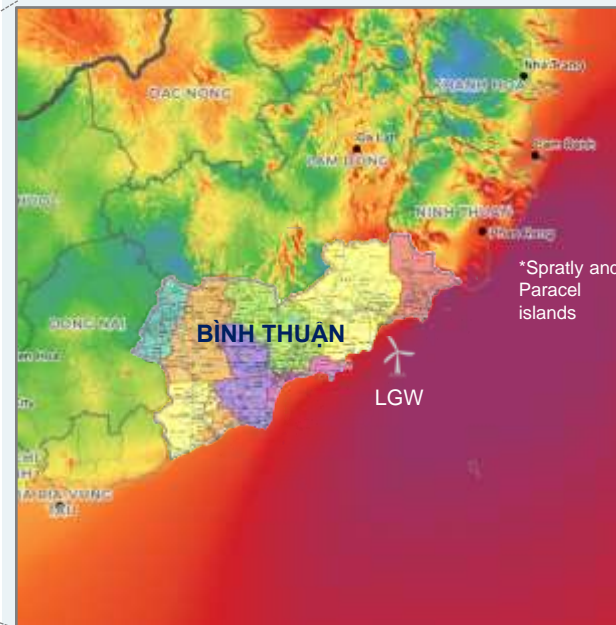
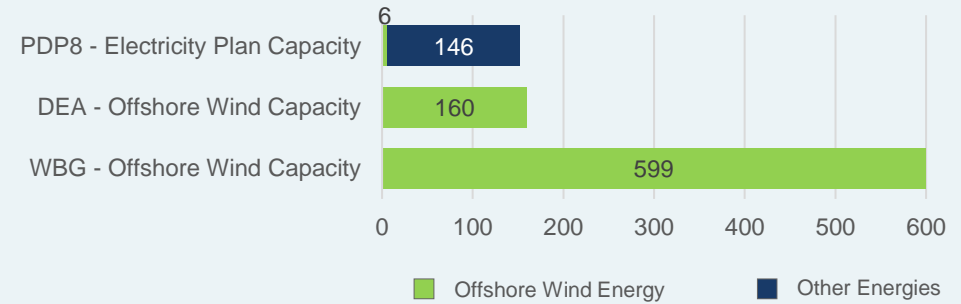
Potential of Offshore Wind in Vietnam

Potential of offshore wind in Vietnam

- World Bank Group estimated that the offshore wind technical potential is **599 GW** (261 GWs for fixed and 338 GWs for floating).
- Danish Energy Agency has identified **160 GWs** (130 GWs for fixed) of non-exhaustive technical potential sites for offshore wind.
- In approved PDP 8 the capacity of offshore wind is **6 GW** in the total capacity approximately 150 GW in 2030.



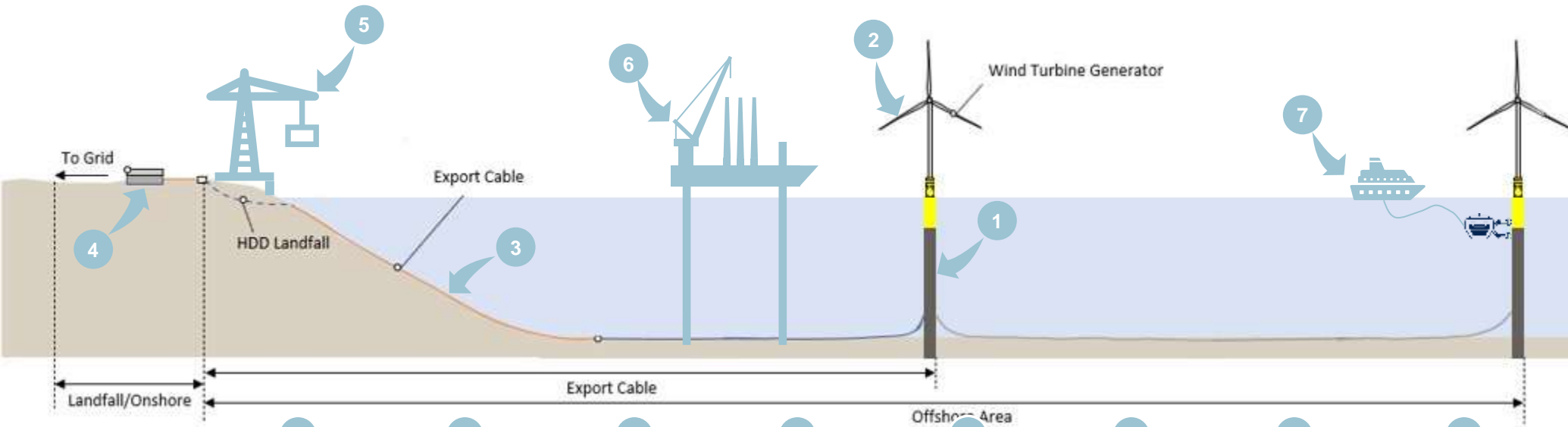
Capacity of Offshore wind (GW)



Binh Thuan Province is one of the most potential province for development of offshore wind farm thanks to following reasons:

- Area with high wind speed. Wind speed at La Gan site is more than 9m/s.
- Offshore site with “shallow water” with small seabed slope.
- In the adjacent are of Southern Key Economic Zone (borders to Ba Ria Vung Tau, Dong Nai)

Overview of Types of Supply Chain Opportunities

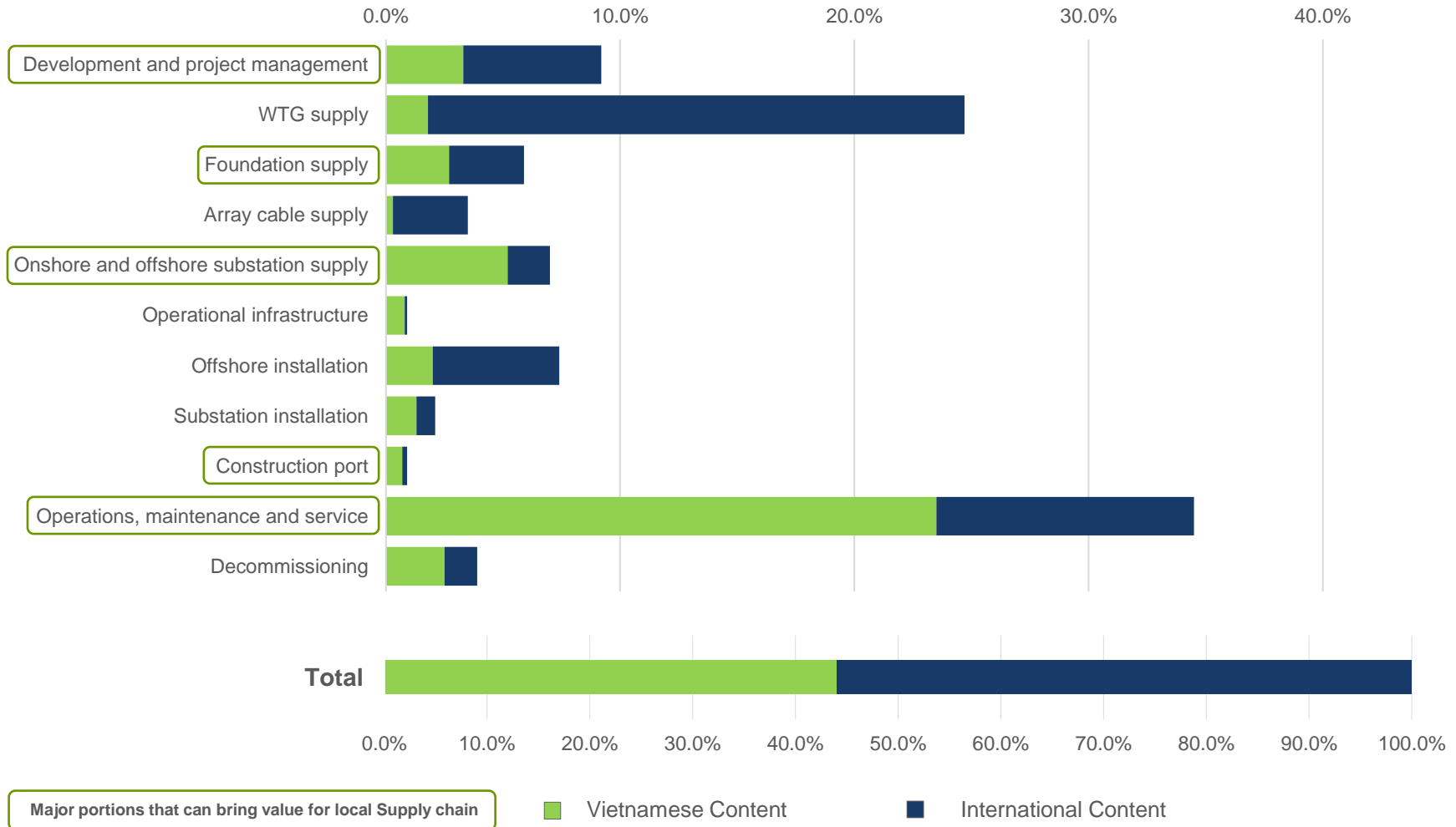


Package/Scope	1 Foundation and steel structure Fabrication	2 Wind Turbine Generator	3 Array and Export Cable	4 Onshore Substation and Infrastructure	5 Port and Logistic	6 Offshore Installation	7 Operation and Maintenance	8 Decommissioning
Tier 1 (Components or Services)	<ul style="list-style-type: none"> Monopile Transition piece 	<ul style="list-style-type: none"> Tower Nacelle Blade 	<ul style="list-style-type: none"> Array cable Export cable 	<ul style="list-style-type: none"> Onshore substation Building Access and security 	<ul style="list-style-type: none"> Foundation WTG Marine services 	<ul style="list-style-type: none"> Foundation WTG Marine cable Commissioning 	<ul style="list-style-type: none"> WTG Offshore Substation 	<ul style="list-style-type: none"> Foundation WTG Marine cable Offshore Substation
Tier 2 Scopes (high level, non-exhaustive)	<ul style="list-style-type: none"> Transport Load/unloading Storage Lifting services Structural steel Office/welfare Anodes Secondary steel 	<ul style="list-style-type: none"> Transport & logistics Lifting equipment Secondary steel Temporary site facilities 	<ul style="list-style-type: none"> Earthworks HDD services Generators Security Temp offices 	<ul style="list-style-type: none"> Earthworks Buildings HV/LV fit-out Plant & Temp offices Security Waste disposal 	<ul style="list-style-type: none"> Foundation WTG Offshore installation service O&M 	<ul style="list-style-type: none"> Transport & logistics Lifting equipment Secondary steel Temporary site facilities Vessels & crew Subsea inspections and repair Guard vessels 	<ul style="list-style-type: none"> CTV's/ports Helicopters Vessels/ROV Inspections Monitoring Data mgmt Technicians Storage 	

Components in green text can be supplied by local suppliers

Potential for localization from La Gan Offshore Wind (3.5 GW)

Vietnamese & International Content



With ~10 billion USD estimated cost for La Gan offshore wind farm projects, Vietnamese Content will be approximately 4,4 billion USD

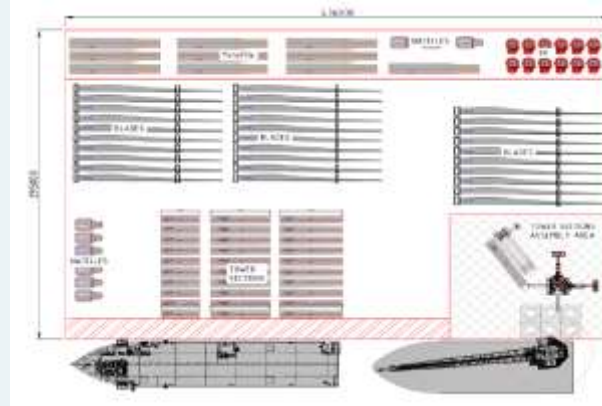
Source: "La Gan Economic Impact Study" by BVG associates February 2021

Ports

Parameter of Port

- For LGW phase 1 with capacity 500MW, if a 15MW turbine is used the requirement for WTG and Monopile port as below:

Parameters	Requirement
DWT	20,000 T
Jetty length	350-400 m
Water Depth	10 m
Area	15 ha
Gound Bearing Capacity	10/20/35 (T/m2)
Navigability	Air gap 180m
Main Equipment	Crawler Cranes, Trailers



Advantage of Local Ports

- Location: The marshalling ports in Vietnam is a **MUST**. The closer is the better for transportation cost and time to optimize offshore installation .
- Sufficient water depth and quay length.
- Sea port therefore no issue about air gap.



Nguồn: Cảng Quốc Tế Vĩnh Tân



Requirement for Upgrade

- Upgrade yard/ jetty bearing capacity, seabed preparation, rent/purchase heavy lift cranes for moving and integration tower sections.



O&M requirement , current , potential

Operation & Maintenance Base Harbour



The onshore O&M base typically consists of

- Harbour facilities (quay side) (~30m per CTV)
- Office facilities incl. meeting rooms, changing rooms etc. (~500 m²)
- Warehouse (~500 m²)
- Outdoor laydown area (~500 m²)

The O&M base will be located within close proximity of the wind farm in order to reduce daily transfer times. Sheltered harbour with 24/7 unobstructed access is preferred.

Transport & Logistics



Crew transfer vessel (CTV) technology

- Most common way of transporting and transferring technicians from O&M base to wind farm
- Cost effective solution for near-shore wind farms
- CTVs are designed with focus on:
 - High speed to reduce transportation time
 - Excellent manoeuvring capabilities
 - Efficient landing / fender system

Typical crew vessel specification

- Efficient landing system enabling safe transfer in high waves (approximately 1.5m Hs)
- Can carry 12 to 24 or more technicians
- Sailing speed is 20-25 knots
- Length is between 20 and 30 meters

Service operation vessel (SOV) technology

- Typical to operate offshore wind farms that are:
 - Large in scale i.e. 1GW or more so many WTGs to service
 - Projects which are very far offshore and difficult to travel out to and back daily

Port Development - Case study

Port of Esbjerg has transformed from declining O&G port to the #1 European offshore wind hub

2002

- ✓ Horn's Rev 1, the world's first large-scale offshore wind farm (160MW) shipped out of Port of Esbjerg

2022

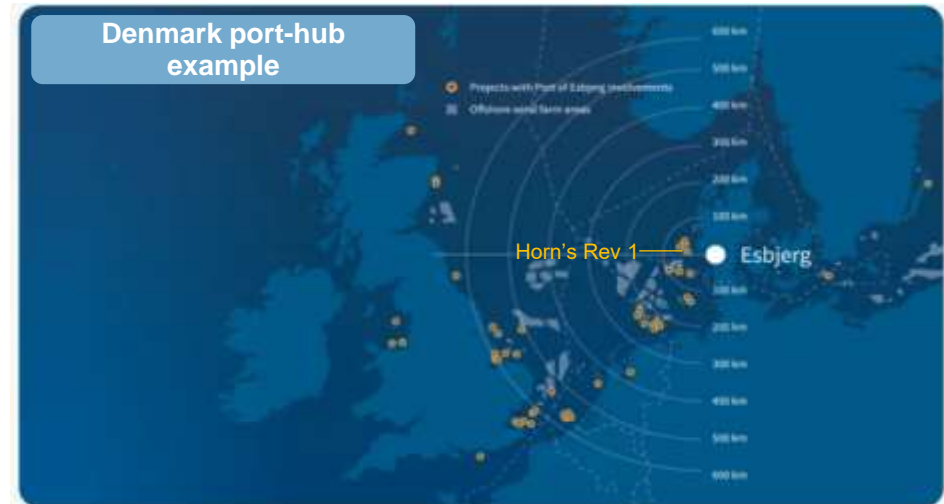
- ✓ Port of Esbjerg is Europe's leading port for handling and shipping wind power (1,200 complete turbines annually)
- ✓ 80% of European installed capacity (23.6GW) shipped from Port of Esbjerg, incl. ~60 projects in U.K., Germany, Netherlands, Belgium, Denmark
- ✓ Specialized facilities and flexible areas for transporting, pre-assembling, shipping and servicing of offshore wind
- ✓ 200 companies covering the entire energy supply chain

Economic development opportunities

- ✓ The unique requirements for offshore wind ports allows **first movers** to become regional supply **hubs**.
- ✓ Involvement in international project **+600 km away** increase in-harbor jobs within fabrication, assembly work, pre-installation work, handling and shipping.
- ✓ Further, main components suppliers locate **new facilities near ports** that are ready or upgrading for pre-assembly and shipping of offshore wind. This implies in-land manufacturing jobs across supply chain
- ✓ Beyond **installation**, Port of Esbjerg serves as **O&M** base for several offshore wind farms, implying facilities for crew transfer vessels (CTVs, transporting crews from harbor to turbines on a daily basis) and Service Operation Vessels (SOVs with living quarters for service technicians throughout campaigns at sea)

Source: Port of Esbjerg

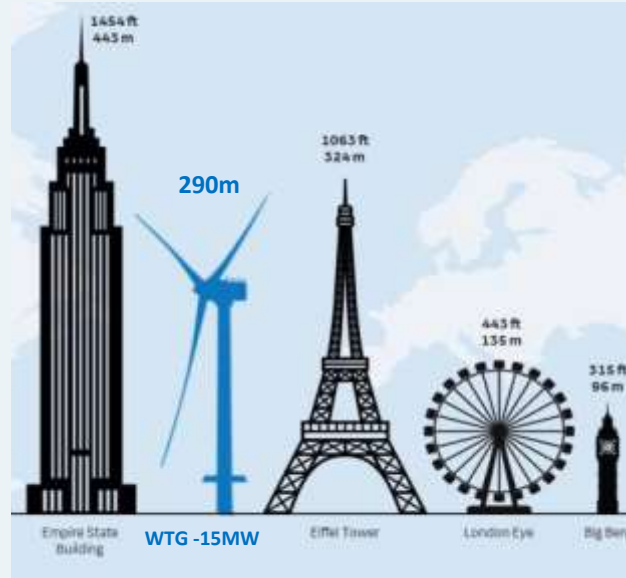
Photo courtesy: Port of Esbjerg



WTG requirement and potential

Major components and parameters of WTG as below

- Nacelle/Hub:
 - Weight: 550-650t
- Tower:
 - Diameter 6-8m
 - Weight: Site specific
 - Height: Site specific
- Blade:
 - Weight: 200t/each
 - Diameter: 220-240m
 - Length: 110-120m
 - Swept area: >40,000m²



Manufacturers in Vietnam

- **Tower** – There are several local suppliers have been manufacturing in Vietnam for smaller size. Plan for new investment with bigger size is in progress.
- **Blade** – There is no manufacturer in Vietnam yet. However, in consideration of significant amount of cost on transportation of the blades. Opening the factories in Vietnam is an optimal solution.
- **Hub/Nacelle** - There is no manufacturer in Vietnam yet.

Blade Manufacturer – Case study

(A Localization Story for CIP/COP projects)

Localization in Taiwan for the factory of Blade

- Vestas and Tien-Li (a local company of Taiwan) has built the first blade manufacturer in Taiwan and produced the first blades for CIP/COP's project in Taiwan (Changfang Xidao and Zhong Neng)



Foundation

Parameter of Monopile and Transition pieces

- For LGW phase 1 with capacity 500MW, the turbine 15MW is anticipated the requirement for the monopile as below:

Parameters	Requirement
Diameter MP	10m-14m
Length MP	65-90m
Weight MP	1,200-1,800T
Total weight MP (34 nos for 500MW)	~50,000T
Weight/ Total Weight TP	~10,000T
Fabrication area	15ha
Storage Area	5ha
Port for loaout	Water depth upto 10m



Advantage of Local Suppliers

- Location: With short distance from manufacturer to offshore site creates the benefit of transportation & logistic cost and time.
- Experience from steel fabrication (from Oil and gas, Wind turbine tower...)
- Labor with very competative cost.
- Many Deep-water Ports and with support infrastructure
- Potential blooming market for 6GW is anticipated with fixed foundations



Photo courtesy: EEW Group

Requirement for Investment

- Cost: 200mil USD.
- Investment duration: 3 years

Supply Chain Development – Vietnam Journey

