**Clarification**

* There are tons of issues affecting life under water, both in saltwater and freshwater environments.
* So, as the first step of Creating Problem Solving, we started clarifying the incredibly broad problem we had chosen.
* Open interaction and brainstorming among our group members threw light on various issues lying around our chosen SDG.
* Further resource collection and discussions identified ‘Fishing’ as a common factor in all the problems we explored.

**Use of three ‘I’ s for the conversion of the problem statement**

* Each group member identified different problems associated with the SDG using data collection and contributed the problem statement related to their problems.
* We reviewed the most important data from every team member.
* Influence, Impact, and Imagination is the criteria we used for the conversion of the problem statement
* This resulted in our first attempt of the drafting of our problem statement.
* “How might we help consumers make an informed decision about the marine products they purchase, and create awareness about the impacts of illegal fishing? ” was our first problem statement in the clarification stage.

**Ideation Stage**

Our team discussed and stretched as many ideas as possible in this ideation stage that would answer our problem statement.   
  
We used brainstorming and our connections as the tools of ideation in this stage.   
  
  
We identified several ideas, generally falling within three main areas: laws and regulations, marketing and public engagement, and technology and information.   
  
But, due to the broad nature of our SDG, we had to go back to the clarification stage in order to refine our problem statement.   
  
After multiple cycles of clarification, ideation and development, we framed our refined problem statement.

**Narrowing down our problem statement:**

6 step processes to monitor complete supply chain of marine products to prevent illegal fishing:

1. Determine the time & location of fishing of each fishing vessel at the ports within the greater Vancouver fishing industry.

2. Monitor if the vessels are fishing legally

3. Determine target species in each area

4. Track change in vessels and their movement.

5. Determine who are the buyers of the marine products and monitor activity.

6. Track each of the lot of marine products.

**Convergence from narrowing down problem statement:**

How to empower stakeholders to monitor the legality of the fishing behavior and to verify the supply chain within the greater Vancouver fishing industry:

1. Generate a report where stakeholders will be able track the supply chain of the product.

2. Provide a unique identifier number of the fishing vessel so that they can track the movement of the vessel

3. The estimated mass of legal and illegal transport vessels.

4. Providing barcodes on each product.

**Development and Implementation:**

How these will help stakeholders to prevent illegal fishing within the greater Vancouver fishing industry:

1. Stakeholders will be able to use this information to prevent illegal shipping.

2. By scanning barcode and figure out the route of fishing to determine if it was legal

3. Empower consumers to know the origin of the marine products if they were legally or illegally harvested and make purchase decisions.

**Resisters and Assisters**

Assisters:

1. NGOs (BC Seafood Alliance, Living Oceans Society, and many others)
2. Ministry of Agriculture, Food, and Fisheries
3. Government of Canada losing $93.8 million in tax revenue and Canadian fishers losing $379 million a year in potential revenue. (<https://oceana.ca/en/blog/canadian-government-has-lot-its-plate-one-those-things-should-not-be-illegally-caught-seafood>)
4. Canada and Canadians generally value sustainability as a progressive developed nation.

Resisters:

1. Canadians spend $160 million on seafood caught illegally every year, whoever profits from that will be a resistor (<https://oceana.ca/en/blog/canadian-government-has-lot-its-plate-one-those-things-should-not-be-illegally-caught-seafood>)
2. Flag of Convenience: When a vessel operates under a different flag instead of its own country’s flag to take advantage of lower fees or so that it is not subject to fishing rules or regulations that it would face under its own flag. More than 1200 commercial fishing vessels were registered to flags of convenience in 2005, and registration of approximately 1600 fishing vessels was unknown (<https://www.dfo-mpo.gc.ca/international/isu-iuu-drvrs-eng.htm>). Most of these vessel profiters will be resisters, almost all of those who operate under flag of convenience will be resisters.

2. (Alternate) Commercial fishing vessels under Flag of Convenience. More than 1200 fishing vessels operated under Flag of Convenience in 2005, and 1600 vessels with unknown registrations also might be fishing illegally.

(I will take out ref. And put them at the end - Amlan)

**The Plan**

1. Use the Automated Identification System to determine when and where each fishing vessel is fishing
2. Use available resources on migratory and spatiotemporal patterns of marine species to infer likely target species of any given vessel
3. Use satellite imagery (Copernicus is open to the research community) and the AIS system to determine whether vessels were fishing legally or illegally
4. Use satellite imagery to estimate the mass of products transferred from fishing to transport vessel based on changes in the transport vessel’s wake (process exists to simulate the wake characteristics based on factors including vessel mass, this regression line would have to be adjusted so that the vessel mass is the target variable and the wake characteristics are used as predictors instead of targets).
5. Create an app to visualize this information based on an inputted MMSI value
6. Create awareness within stakeholder communities (port authorities to gain acceptance, public to build enthusiasm) about this newly available information

**Actions:**

In this order (from short term to long term):

1. Build and Launch social media handles and website and maintain the profiles regularly to establish digital presence
2. Continue to connect with experts and authorities to further validate our problem and solution
3. Integrate technologies into a cohesive system and build a reverse-engineering process of detecting changes in vessel mass based on changes in wake patterns.
4. Iteratively validate and adjust our solution in coordination with Greater Vancouver Fishing Industry and Ministry of Agriculture, Food, and Fisheries.
5. Once we can manage how seafood that gets to the port can be regulated, or at least be traced for illegal sourcing, we will eventually get to the supply chain from port to consumers.