

DESIGN OF URBAN MARKET WITH SIGNIFICANCE TO OUTDOOR THERMAL COMFORT

A Thesis

Submitted in partial fulfillment of the requirements for the award of
Master of Architecture degree in Sustainable Architecture

by

MANJARI A (39890010)



**DEPARTMENT OF ARCHITECTURE
SCHOOL OF BUILDING AND ENVIRONMENT**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

MAY 2021



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

www.sathyabama.ac.in



DEPARTMENT OF ARCHITECTURE

BONAFIDE CERTIFICATE

This is to certify that this Report is the bonafide work of **MANJARI A (39890010)** who carried out the Thesis entitled "**DESIGN OF URBAN MARKET WITH SIGNIFICANCE TO OUTDOOR THERMAL COMFORT**" under our supervision from January 2021 to May 2021.

Internal guide
(Ar. EBIN HARRISON)

Internal Panel Member
(Ar. SHEETAL AMRAOTKAR)

External guide
(Ar. BALAMURUGAN)

DR. DEVYANI GANGOPADHYAY
Dean, School of Building and Environment
Department of Architecture

Submitted for Viva voce Examination held on _____

Internal Examiner

External Examiner

DECLARATION

I MANJARI.A hereby declare that the Pre-Thesis Report entitled “**DESIGN OF URBAN MARKET WITH SIGNIFICANCE TO OUTDOOR THERMAL COMFORT**” is done by me under the guidance of **AR. EBIN HARRISON** (Internal) and **Ar. BALAMURUGAN RAJKUMAR, Principal Architect -Proton Ateliers** (External) at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Master of Architecture degree in Sustainable Architecture.

DATE:

PLACE:

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this Thesis project and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr. Devyani Gangopadhyay, Dean and Head of the department, Dept. of Architecture, School of Building and Environment**, for providing me necessary support and details at the right time during the progressive reviews.

My special thanks to **Dr. Suresh Kuppusamy**, our Design chair and **Ar. Balamurugan Rajakumar**, (External guide) and **Ar. Sheetal Amraotkar** (Thesis Coordinator) for their valuable comments and guidance during the project work.

I would like to express my sincere and deep sense of gratitude to my Project Guide **Ar. EBIN HARRISON** for his valuable guidance, suggestions and constant encouragement which paved way for the successful completion of my project work.

I wish to express my thanks to all Teaching and Non-teaching staff members of the Department of Architecture who were helpful in many ways for the completion of this Thesis.

ABSTRACT

The society has a major demand for speed and efficiency and it has resulted in the market typology. Due to globalization, things around us are constantly evolving and getting modernized, for an instance 'santhai'(open market space)has evolved as super market. Open market spaces are getting confined into big box supermarkets provide shoppers with quick service but ultimately lacks sense of place and social interaction. This thesis is about rethinking the roles of markets as a new type of social area in urban context. And will act as exchanging medium between communities not only economically, but also socially. The study mainly focuses on markets in Chennai. It has been over two decades since the Koyambedu wholesale market was inaugurated. But the city's hub for perishable goods continues to lack basic facilities. Not only koyambedu market, but most markets in Chennai have similar problems. So, the basic ideology is to create a wholistic commercial hub and to reverse the impacts of unsatisfactory quality of life in general. Methodology for the study will be carried out through analysis on the outdoor thermal comfort and microclimate of different types of markets in Chennai. The inference from brief field study will be used to mitigate the problems. Pedestrian comfort will be achieved to enhance the experience of open market.

TABLE OF CONTENT

CHAPTER No.	TITLE	PAGE No.
1	AIM	10
2	OBJECTIVE	10
3	WORKFLOW	11
4	OUTDOOR THERMAL COMFORT	12
5	IMPORTANCE OF OUTDOOR THERMAL COMFORT	12
6	THE PARAMETERS OF OUTDOOR THERMAL COMFORT	13
7	METHODOLOGY	14
8	LITERATURE STUDY	15
9	LIVE CASE STUDY	17
10	CLIMATE ANALYSIS	22
11	SITE ANALYSIS	23
12	FORMIT ANALYSIS	33
13	ENVIMET ANALYSIS	38

13.1	ENVIMET INFERENCE	72
12.3	PROPOSAL ENVIMET ANALYSIS	73
13	PROPOSED PLAN	78
14	REFERENCES	79
15	ANNEXURES	80

LIST OF SYMBOLS AND ABBREVIATIONS

T_a	-	Air Temperature
T_{mrt}	-	Mean Radiant Temperature
V	-	Wind Speed
RH	-	Relative humidity
PET	-	Physiological equivalent temperature
SVF	-	Sky view factor
U value	-	Thermal Transmittance
R value	-	Thermal Resistance

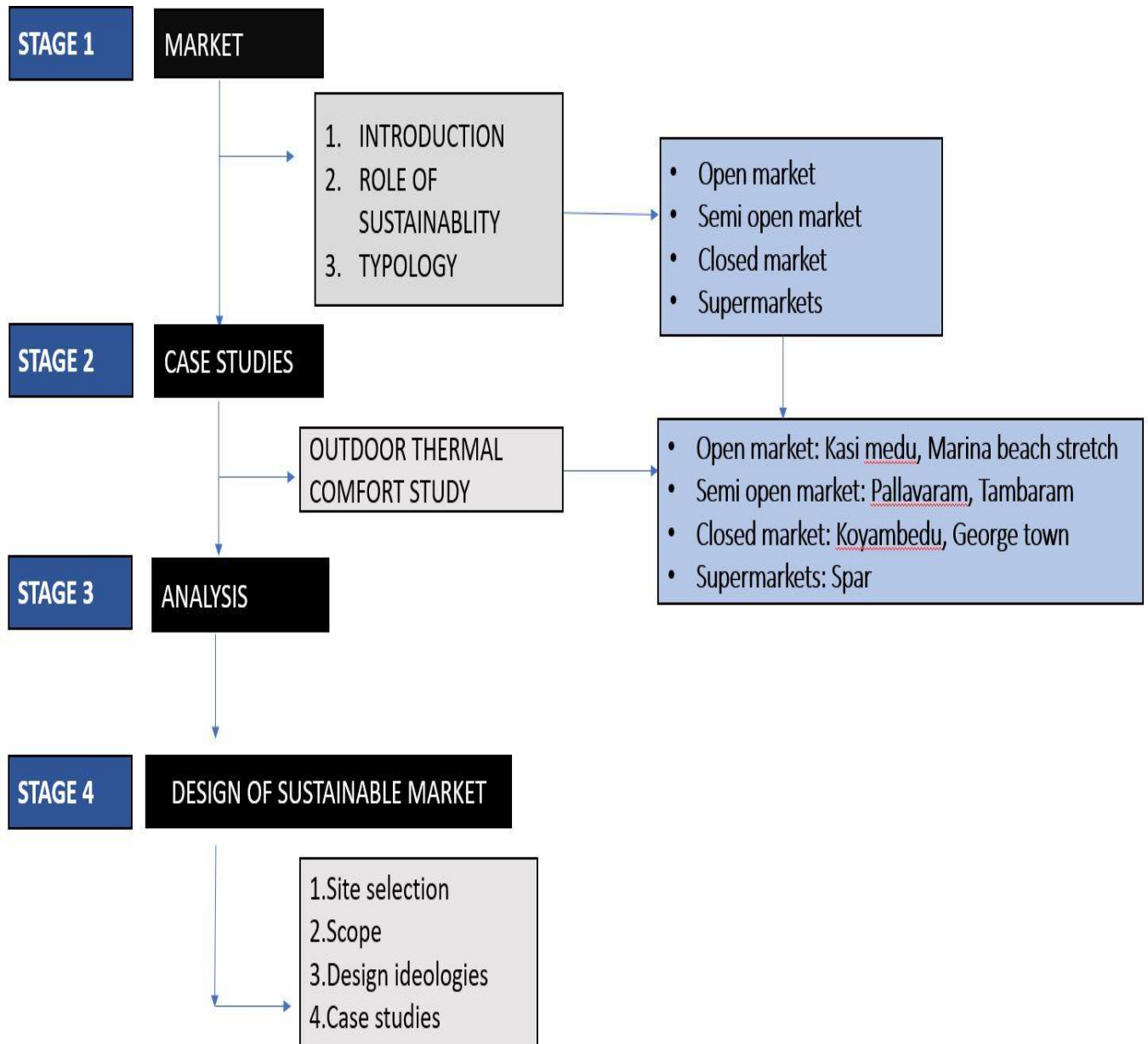
1 AIM:

The aim is to create a wholistic commercial hub.

2 OBJECTIVE:

- The main focus is to understand outdoor thermal comfort and air quality in market and also the effect of microclimate in market complex.
- And also addresses the contribution of street design toward the development of a comfortable microclimate at street level for pedestrians.
- Street geometries are studied, including various aspect ratios, i.e. height-to-width ratio H/W , solar orientations.
- Effects of open spaces, semi open spaces, trees, textured façades with the aspect ratio and solar orientation.
- Studying the impacts of unsatisfactory quality of life in general in markets.

3 WORK FLOW



4 OUTDOOR THERMAL COMFORT

- Outdoor spaces providing a pleasing thermal comfort experience for people and effectively improve the quality of urban living.
- Thermal Comfort is the condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluations.

5 IMPORTANCE OF OUTDOOR THERMAL COMFORT

- Thermal comfort is important for health and well-being as well as productivity.
- A lack of thermal comfort causes stress among building occupants. When they are too warm, people can feel tired; when too cold, they will be restless and distracted.
- The outdoor thermal environment is greatly influenced by the built environment, e.g. anthropogenic heat, evaporation and evapotranspiration of plants, shading by trees and man-made objects, and ground surface cover such as natural grass and artificial paving, etc.
- People experience different thermal sensation while carrying out the outdoor activities in streets, plazas, playgrounds, urban parks, etc.
- Thermal Comfort is the condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation.

6 The parameters of Outdoor Thermal Comfort

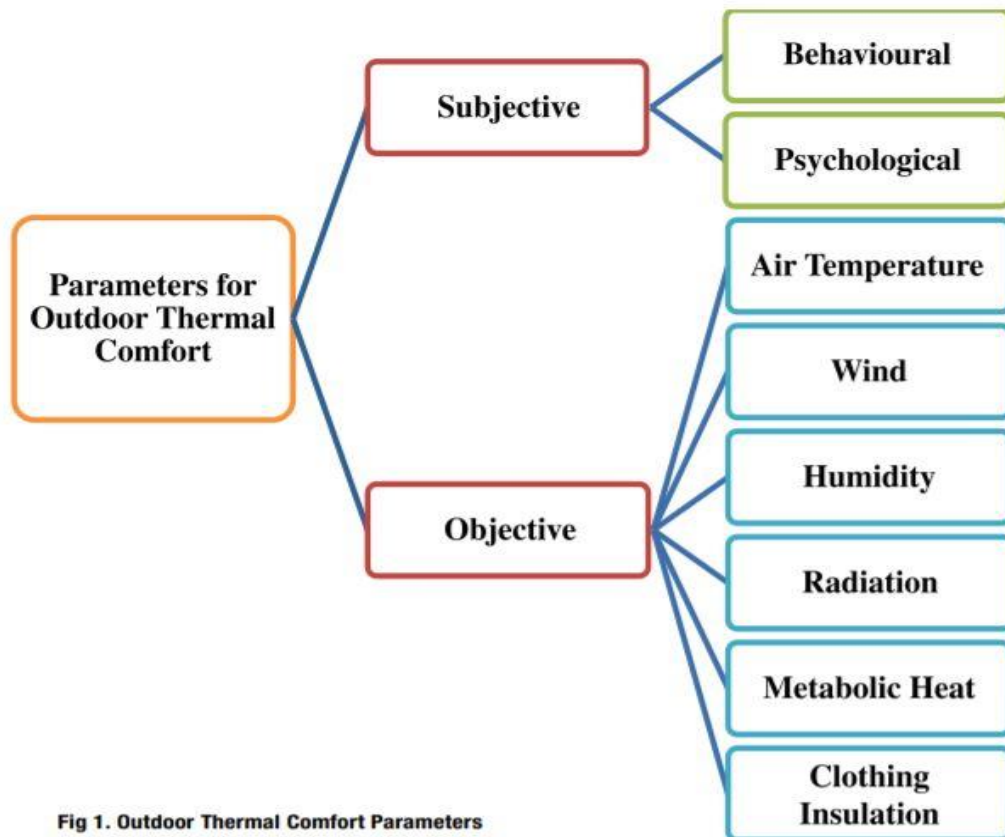


Fig 1. Outdoor Thermal Comfort Parameters

6.1 Micro-Meteorological Measurement:

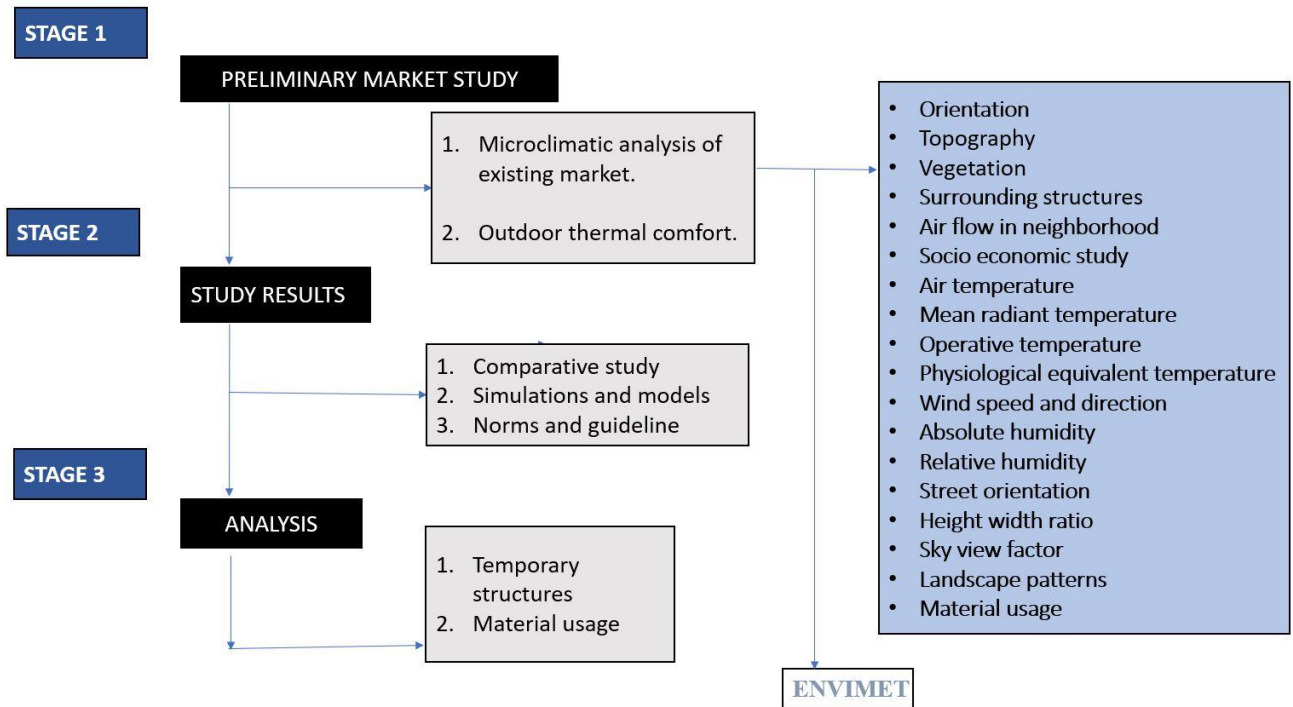
- This includes physical measurement of the microclimatic conditions at the immediate

surroundings of the subjects.

- The four main physical parameters those characterize thermal environment and thermal comfort sensation are
 - i. Air temperature
 - ii. Relative humidity
 - iii. Wind
 - iv. Solar Radiation

ASHRAE SCALE		BEDFORD SCALE		SEVEN POINT		NINE POINT	
Hot	3	Much Too Warm	3	Very Cold	1	Very Cold	1
Warm	2	Too Warm	2	Quite Cold	2	Cold	2
Slightly Warm	1	Comfortably Warm	1	Cold	3	Cool	3
Neutral	0	Comfortable	0	Comfort	4	Slightly Cool	4
Slightly Cool	-1	Comfortably Cool	-1	Hot	5	Neutral	5
Cool	-2	Too Cool	-2	Quite Hot	6	Slightly Warm	6
Cold	-3	Much Too Cool	-3	Very Hot	7	Warm	7
Source: Nasir et al., 2012						Hot	8
						Very Hot	9

7 METHODOLOGY



SECTION ONE

Age:; Nationality:; Gender: Male/Female

Weight (kg):; Height (cm):

What is your clothing now?

☐ Saree ☐ dhoti ☐ jeans ☐ kurti

SECTION TWO

How do you experience/feel the present temperature?

☐ Cold ☐ Cool ☐ Slightly cool ☐ Neutral ☐ Slightly warm ☐ Warm ☐ Hot

How would you prefer the temperature to be?

☐ Much warmer ☐ A bit warmer ☐ No change ☐ A bit cooler ☐ Much cooler

How do you experience the air movement (windiness)?

☐ Very high ☐ High ☐ Slightly high ☐ Neither high nor low

☐ Slightly low ☐ Low ☐ Very low

How would you prefer to have the air movement?

☐ Much more air movement ☐ A bit more air movement ☐ No change

☐ A bit less air movement ☐ Much less air movement

How do you experience the humidity (wetness fraction)?

☐ Very humid ☐ Humid ☐ Slightly humid ☐ Neither humid nor dry

☐ Slightly dry ☐ Dry ☐ Very dry

How would you prefer the humidity to be?

☐ Much drier ☐ A bit drier ☐ No change ☐ A bit more humid ☐ Much more humid

How would you rate your overall comfort at this moment?

☐ Very comfortable ☐ Moderately comfortable ☐ Slightly comfortable ☐ Neutral

☐ Slightly uncomfortable ☐ Moderately uncomfortable ☐ Very uncomfortable

What measures would you prefer to take if you felt it is too hot?

☐ Move to shaded place ☐ Open umbrella/wear hat

☐ Reduce clothing ☐ Nothing go away ☐ Get more to drink

SECTION THREE

1. If you are not from Tamilnadu, how long have you been in Tamilnadu?

2. Why do you come to this specific location at the campus?

3. How long have you been to this specific location?

4. How often do you come to this specific location?

5. Where have you been in the last 15/20 minutes?

6. What activities have you done in the last 15/20 minutes?

SECTION THREE

1. If you are not from Tamilnadu, how long have you been in The Tamilnadu?

2. Why do you come to this specific location at the campus?

3. How long have you been to this specific location?

4. How often do you come to this specific location?

5. Where have you been in the last 15/20 minutes?

6. What activities have you done in the last 15/20 minutes?

NAI MUEANG, THAILAND

•Architects: Bangkok Tokyo
Architecture

The market is situated in front of a local mall in Nakorn Ratchasima, some 250 km northeast of Bangkok and gateway to the Northeastern provinces of Thailand, the market offers a diverse array of goods. The name "Dadad" meaning "various or plentiful " in Northeastern slang best captures the essence of this temporary market, serving as a gathering spot for locals and youngsters alike.



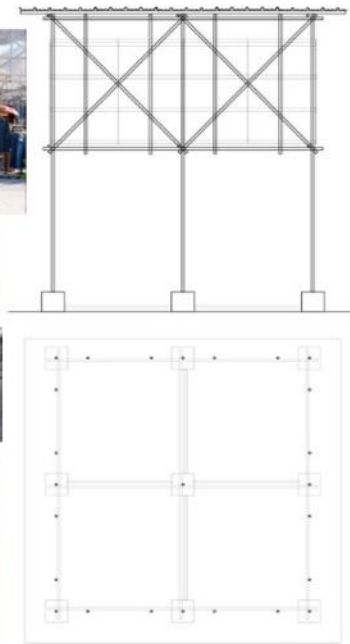
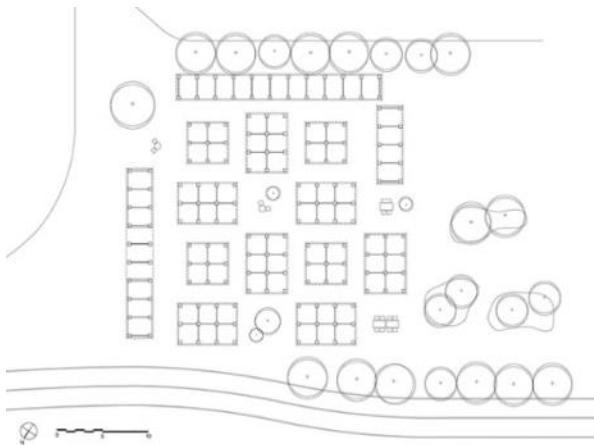
In Thailand the streets come alive with the colorfully lit tents and food stalls of local merchants. The project celebrates this spontaneous phenomenon, creating floating structures of light in the night-time cityscape. Thailand has a predominantly tropical wet and dry climate.

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARS	# CITIES
Average Temperature (C)	26.7	24.1	25.8	27.7	29.2	28.7	28.1	27.6	27.4	27.2	26.7	25.5	24.1	22	71
Average High Temperature (C)	31.6	30.4	32.1	33.8	34.7	33.4	31.4	31.6	31.2	31	30.9	30.2	29.7	22	70
Average Low Temperature (C)	22	18	19.8	21.9	23.8	24.3	24.2	23.8	23.8	23.4	22.6	20.8	18.6	22	70
Average Precipitation (mm)	1611.9	28.3	23.1	40.7	85.3	183.9	177.2	196.4	219	252.7	190.9	125.1	57.8	42	69

* Years is the average number of years used to compute the average. # Cities is the total number of locations used to compute the average.



- While signaling and attracting customers from a distance, the floating light -boxes also showcase the eclectic merchandise and movement underneath it.
- The structure itself can be easily dismantled and re-assembled.
- It consists of repetitive pipe members and clamps similar to those of typical scaffolding system.
- Simple frames in a check -board layout create a microcosm of little plazas and alleyways accessible from many directions.



consisting of repetitive pipe members and clamps similar to those of the typical scaffolding system, the structures can be easily dismantled and reassembled. the simple frames in a check-board layout result in a microcosm of little plazas and alleyways accessible from many directions and easy to navigate for the visitors.

The Pop-Up Market: The pop-up market is generally organized by local groups with minimal municipal support. They are characterized as places where small vendors can set up a simple tent and display tables of goods. Pop-up markets are highly mobile with a small footprint. The vendors are expected to bring everything they need to the market; very little is provided by the organizers other than schedule and location. Some are augmented with local music, arts or events if space allows.

- **Scale:** Small to extra-large (varies)
- **Hours:** Varies Avg. Vendor Stall: 10x10' or 10x30' if tailgate style market.
- **Site Conditions:** Roadside, open green space, urban park, parking lot.
- **Shelter:** Tents and canopies installed by vendors during hours of operation.
- **Infrastructure:** Plug-in power from lamp posts, generators and vendor-provided power source or none. Portable toilets may be present. Funding Structure: Vendor rent w/ supplemental public support.
- **Precedent Projects:** Village Farmers Markets; Pallavaram Friday market

Pallavaram Friday market



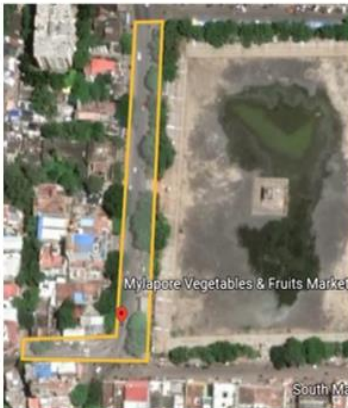
Pattinapakam fish market



Pallavaram Friday market



Kasimedu fish market



Mylapore market:

- The market is 85 years old and started nearly 1940. The market is fully maintained by private organization.
- **Market timings:** Peak hours 7:00 AM to 9:00 AM and 7:00 PM to 10:00 PM. Market is more alive on festivals with different Peak hours.



The Modular Market : Modular markets are usually structured for flexibility and organization. Modules organize the floor plan, the structure or both. Modular units are usually deployed and customized by vendors depending on their needs and based on climate, aesthetics or stall layout. Modular markets are adaptable to different sites and configurations within a big city or small town

Pallavaram daily market:

- **Scale:** 1-20 vendors; small to medium.
- **Hours:** Varies. Avg.
- **Vendor Stall:** 10x10'
- **Site Conditions:** Roadside, open green space, urban park, alleyways, parking lots, underutilized urban spaces. Sites are exploited for unique qualities and inspire the market display.
- **Shelter:** Semi-permanent stalls that remain on site for vendors to use.
- **Infrastructure:** Plug-in power from municipality or vendor-provided power source. Rare cases of portable toilets or public bathroom facilities.
- **Funding Structure:** Vendor rent with public support.
- **Precedent Projects:** Mylapore market, Pallavaram daily market.



Koyambedu Wholesale Market Complex



- Koyambedu Wholesale Market Complex has around 3154 shops where vegetable, fruit and flower is sold.
- one of the largest markets in Asia.
- Approximately one lakh people are visiting the market complex daily for trading purpose, subsequently more vehicles are also entering into the market and it is expected to increase significantly during peak festival seasons.

- Koyambedu Wholesale Market Complex has around 3154 shops where vegetable, fruit and flower is sold. one of the largest markets in Asia. Presently, the flower market functions on around 270,520 sqft inside the Koyambedu Wholesale Market that spreads over 11.25 lakh sq.ft of land.

INFERENCES:

Unsatisfactory quality of life in general in the CBD.
Heavy Vehicular traffic.
Poor maintenance.

The Destination Warehouse Market: Destination warehouse markets utilize a structure as market shelter. These structures can be long span roofs, a collection of roof canopies or even old renovated buildings. Sometimes the buildings are preexisting; other times they are built specifically to house a market. Destination warehouse markets range from semi closed to completely enclosed, depending on the type of structure. All utilities are onsite as part of the base of the building and are provided for both vendors and customers. These buildings are very flexible and allow for a multitude of vendors and events: there are upwards of 20 vendors who each rent their own individual stall/space. Since they are semienclosed or enclosed, they are open seven days a week, yearround. These markets are central to community life function

- Scale: 20+ vendors; medium to large.
- Hours: 7 days a week
- Avg. Vendor Stall: Range 10x10' - 20x20'
- Site Conditions: Nearby to parking or public transit; central to community.
- Shelter: Long span roof, collection of roof canopies, semi-enclosed/enclosed.
- Infrastructure: All utilities are on-site and provided for vendors as part of the base building.
- Funding Structure: Vendor rents.
- Precedent Projects: Koyambedu Market



Burma Bazaar



- This market run by Burmese refugees. It is located at Parrys Corner and is one of the several unorganized or grey market shopping hubs of Chennai.
- The bazaar was set up in 1969 by the Government of Tamil Nadu.
- It is located just outside the Chennai Beach railway station, in the old financial district of the city at George Town.
- It is a row of about 200 shops that line either side of the road for about a kilometre.
- The bazaar extends to about a kilometre along the Chennai Beach railway station. There are an estimated 200 shops in the bazaar.



With several passengers coming out of the station every few minutes, the market appears busy all the time. It is estimated that over 100,000 people pass through this corridor every week.

The Bazaar Market Description: A bazaar is a permanent enclosed marketplace or a street of shops where goods and services are exchanged or sold. The term bazaar is also sometimes used to refer to an openair marketplace, a commercial quarter or the network of merchants and craftsmen who work in that area

Hours: 6-7 days a week.

Avg. Vendor Stall: Varies.

Site Conditions: Located within cities, sometimes taking up entire neighborhoods.

Shelter: Small, streetside shops, large complexes divided up by different vendors or a combination of the two.

Infrastructure: All utilities are on-site and provided for vendors as a part of the base building. In some cases there may not be any utilities at all.

Funding Structure: Vendor rents.

Precedent Projects: Burma bazaar



Pallavaram market:



The market is 80 years old and started nearly 1932. The market is fully maintained by private organization and there's no interference of government. And the non veg market has its own committee members. And it cannot be used by others.

There are 150 shops in the whole stretch of 0.5 kilometres. The shops include vegetables fruits, fish, meat, Flowers, etcetera. Market timing 6:00 AM- 2:11 PM. Peak hours 7:00 AM to 10:00 AM at 4:00 PM to 10:00 PM. Market is more alive on Sunday with different Peak hours.

Pallavaram Friday market



The market was initially established in 1800s to sell cattle. Now it is led by the government and every year it is let for lease and the person who gets the least coordinates the Friday market. Sellers of the market must pay the rent to coordinator the rent rates product, goods and vehicle. The whole stretch is 3 kilometre and the shops include vegetable, fruits, pets, electronic toys and furniture.

1,00,000 and above floating population on Friday increases and 70% people from different place will reach out here to shop.

INFERENCES: No proper parking facilities, no proper structure for the vendors, cattle wandering over the market, side roads are smaller in with causing congestion during unloading of goods. There are no basic facilities for the people. The waste is not clean properly.

The Pavilion Market Description: Pavilion markets typically consist of an openwalled building in which vendors purchase a space to sell their products. Visitors get the feeling of being under cover, while at the same time being outdoors. The size is usually small to medium size, with the number of vendors inside varying. The markets can be open daily.

- **Scale:** medium to large.
- **Hours:** Varies.
- **Avg. Vendor Stall:** 10x10'
- **Site Conditions:** Located within a city. Almost like an icon within a city.
- **Shelter:** Overhead roof canopy with open walls on all sides.
- **Infrastructure:** Some plug-in power may be provided on site.



Tambaram market

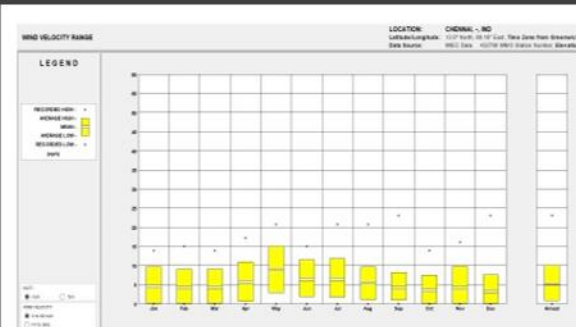
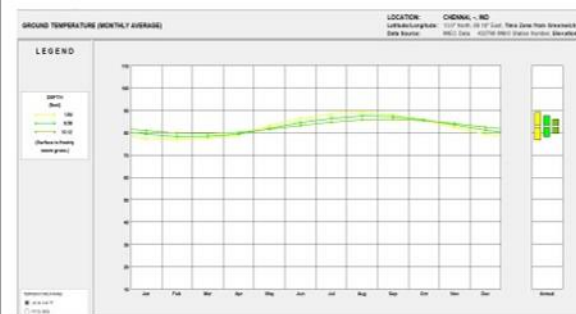
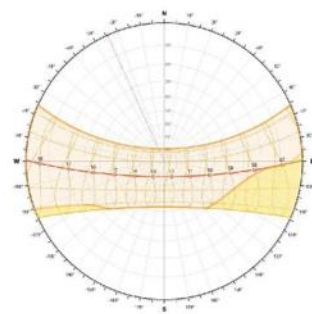
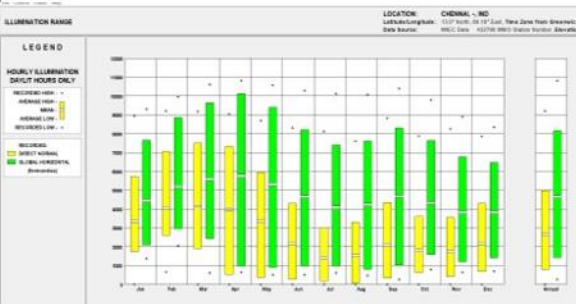
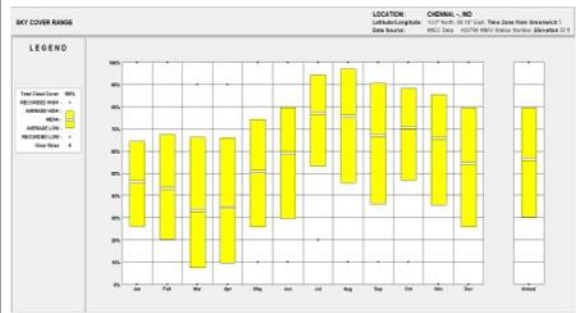


Zam Bazaar

- One of the oldest bazaars in the city, Zam Bazaar in Triplicane was set up in the pre-Independence era.
- Zam Bazaar is a huge single-storied building housing more than 800 shops in and around it.
- There are shops for fresh vegetables, various meats, fish, rice and banana leaves. More than 4 generations of the same household have owned and run some of the shops here.
- Building and running private markets was a prestige issue and an economically attractive business, the novelty of which attracted entrepreneurs back then.
- Zam Bazaar, and similar markets, were regularly inspected for their sanitary conditions, state of facilities and were licensed periodically.

INFERENCES:

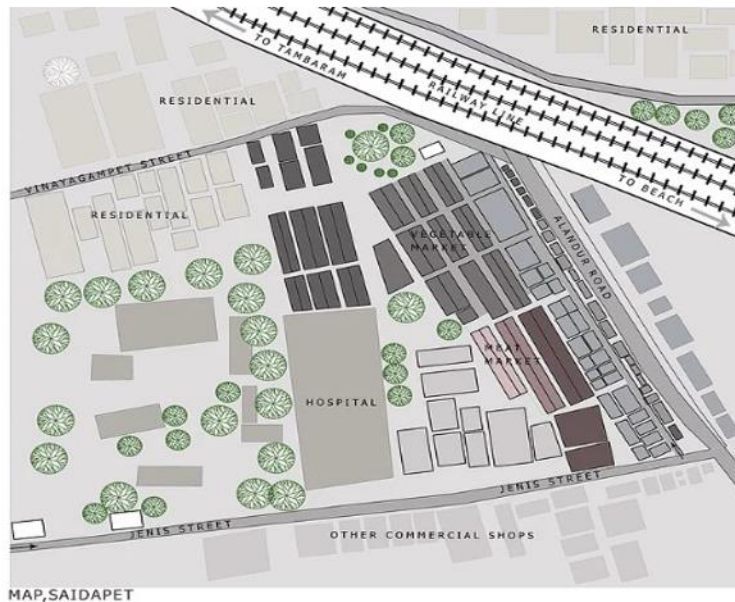
Not having being maintained over the years, the heritage structures are now dilapidated, they are crumbling and dangerous to operate from. The locals however oppose demolition and relocation.





- Saidapet was founded by the Nawab of the Carnatic in the 18th century AD and was named Sayyid Khan Pettah after Sayyid Khan, the army commander of the Nawab's forces.
- When the kingdom began to decline, Saidapet was occupied by the British East India Company and was made the administrative headquarters of Chingleput district.
- Two-storied structures, designed to retain the street shopping experience, which will make the Saidapet market a mini-Koyambedu for residents in the south of the city.

problems : Congested shops, flies and mosquitoes, shops with sacks serving as canopies, inadequate lighting and toilet facilities. Outdated sanitation and inadequate fire and safety measures leave the population very vulnerable to natural and man-made calamities. Visitors are met with heaps of rubbish.



MAP, SAIDAPET

LEGEND

- GOVERNMENT HOSPITAL
- OTHER COMMERCIAL SHOPS
- FLOWER MARKET
- VEGETABLE MARKET
- FRUIT MARKET
- CHICKEN MARKET
- FISH MARKET
- DRY FISH MARKET
- OTHER COMMERCIAL SHOPS
- OTHER NON-PERISHABLE GOODS
- NEW MARKET
- RESIDENTIAL

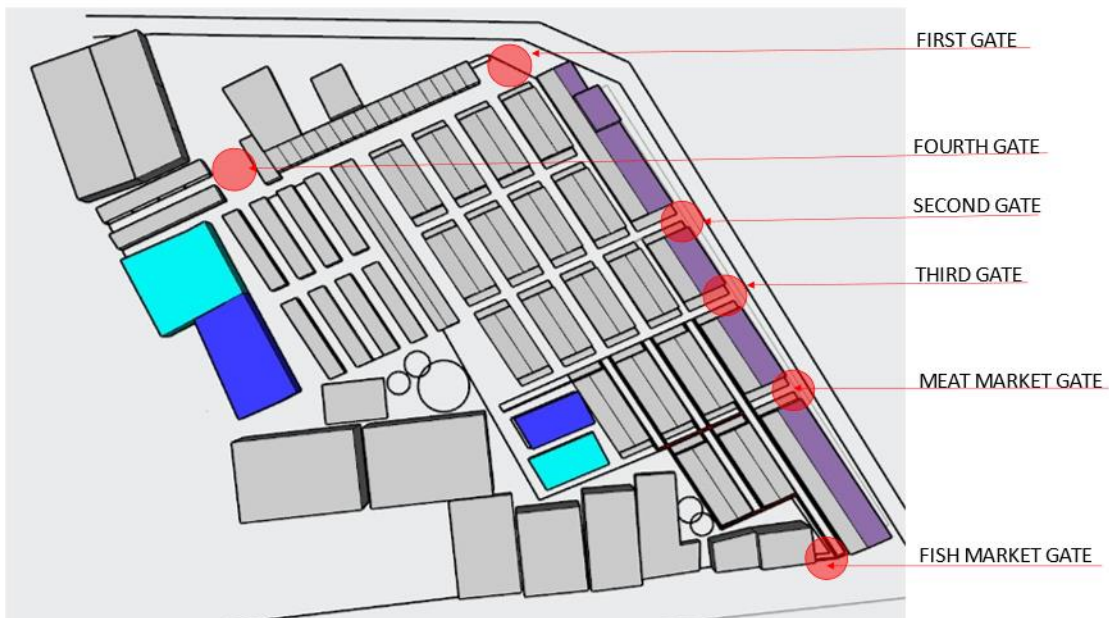


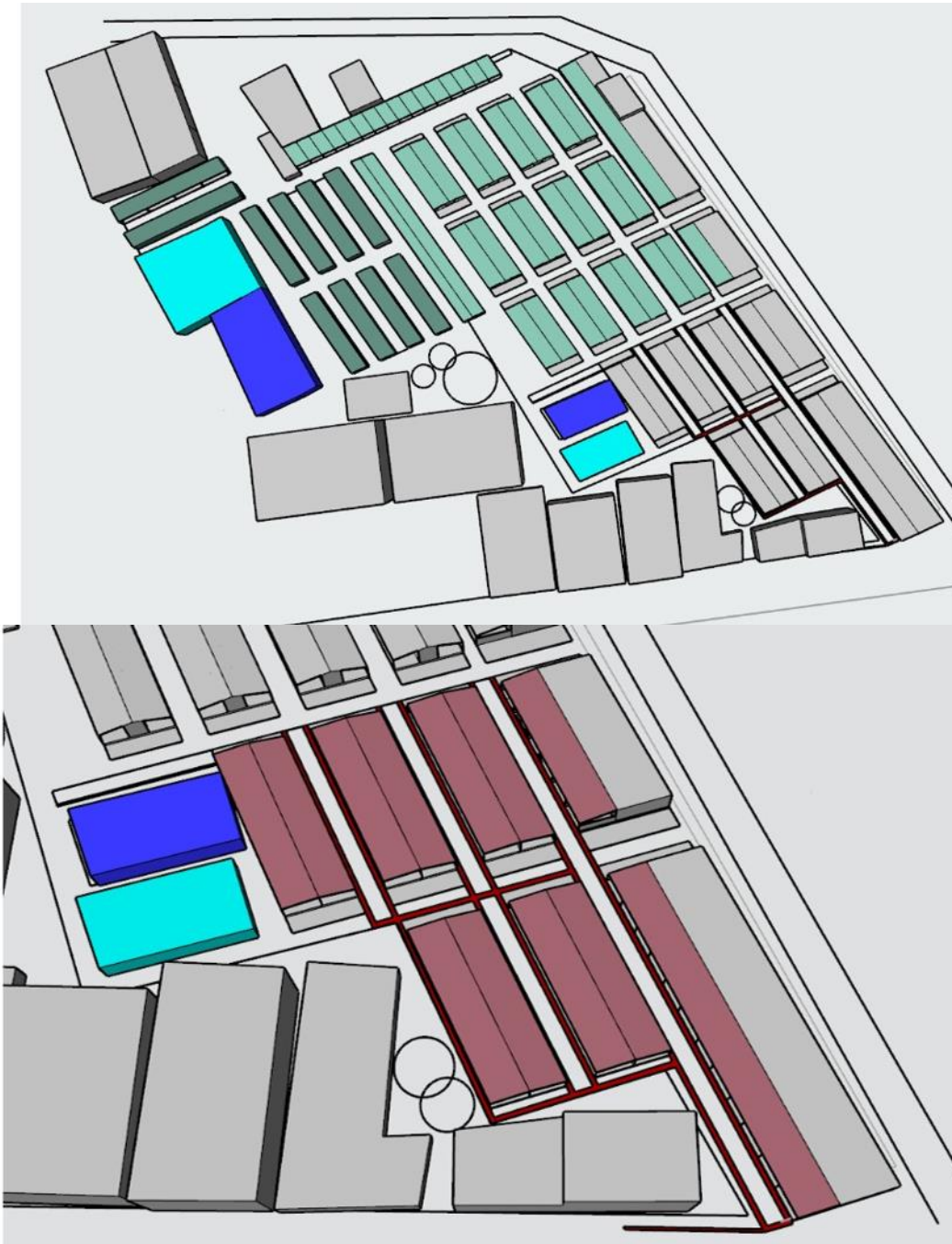
- ENTRY/EXIT
- TRANSFORMER
- SUB-ARTERIAL ROAD
- UNLOADING VEGETABLES
- WATER TANK
- PEDESTRIAN
- GARBAGE DISPOSAL
- UNLOADING MEAT

STREET HIERARCHY| SERVICES|INFRASTRUCTURE



- This market is situated near Saidapet railway station which is one of the very busiest areas in Chennai.
- Roofing -Sloped roof with mangalore tiles and temporary tarpaulin roof over the pedestrian path.





Ariel view - Saidapet



Aerial view of Maraimatal Adigal Bridge, previously known as Marmalong Bridge, across Adyar River in Saidapet



Jenis road

Leading to the market area

Bus stand
Saidapet has a MTC bus terminus located on Anna Salai.
Saidapet has a MTC bus terminus located on West Jones Road

Police station



Bus depo



Saidapet post office



CSI Church



Railway station

The Suburban Railway station in Saidapet is located between the stations of Guindy and Mambalam.

Bridges

The bridge located near the market on Jenis road serves as a vital link to Mount Road from West Saidapet.
Aranganathan subway serves to connect Ashok Nagar and Mambalam.

Alandhur bridge to connect Guindy Industrial Estate and West Saidapet



Market scene outside jenis road



Panagal Maaligai or Panagal Building, built upon the site of an older building of the same name functions as a Revenue Office and is so named after the Raja of Panagal. Its predecessor functioned as Chingleput District Collectorate



Market scene inside



Metro Rail

Metro Rail connects to Alandur in the South and Chamiers road in the North as part of the Chennai Metro Rail Scheme.

Saidapet's very busy shopping market place called the Bazaar Road. It is famous for its fish and meat market attracting buyers from faraway places



N

IMPACTS

- The market has in the recent past been beset by problems :
- Congested shops, flies and mosquitoes, shops with sacks serving as canopies, inadequate lighting and toilet facilities official.
- Out-dated sanitation and inadequate fire and safety measures leave the population very vulnerable to natural and man-made calamities.
- Visitors are met with heaps of rubbish and rodents scurrying around.
- No system for waste disposal exists even today.



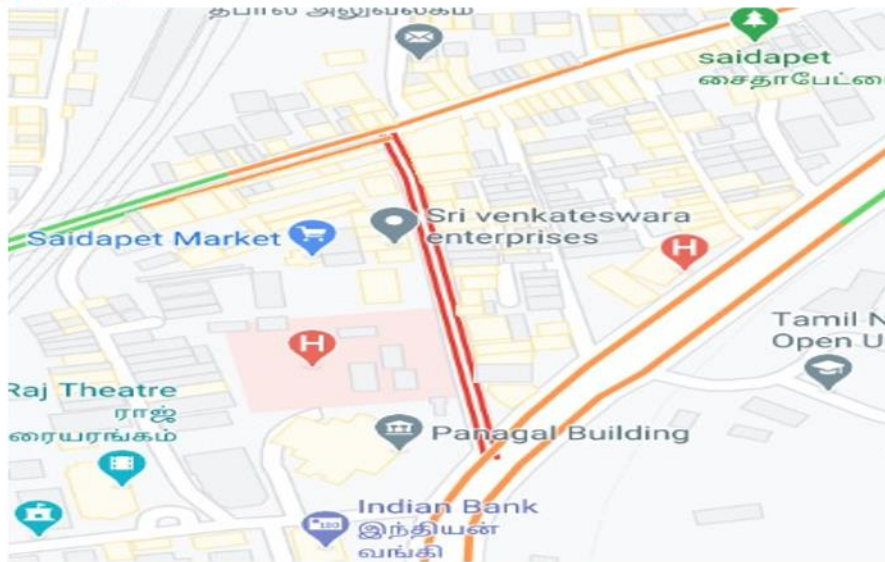
REASON:



HIGH DENSITY HOUSING- 60% MEDIUM DENSITY- 32% LOW DENSITY- 8%

- High density of population is due to the settlement of the people since the evolution of saidapet
- This includes most of the people belonging to the weaving profession, fishing and also people settling because of the devotion to family land.
- This majorly has an effect on the urban context as it plays as an important role in determining the scope for the future expansion to meet the urban needs.
- Unfortunately, Saidapet lacks the flexible nature of accommodating more open spaces, public gatherings or plazas or parking in future.
- Hence giving rise to the increase in the verticality development for accommodating the urban requirement.

TRAFFIC MAP



- Due to encroachment the roads are always busy.
- The parking spaces and building frontages are occupied by vendors.
- The congestion in traffic results in air quality of the neighbourhood.

VEGETATION MAP:



- Due to rapid growth in urbanization, there's very less space left for vegetation.
- This ultimately affects the air quality of the area.
- Building density goes higher towards the south.
- Because of railway line in the northern side building density is less and it results in more vegetation when compared to the urbanized southern zone.
- some of the tree species founded in the pungan (Indian beech), neem, malai vembu (Malabar neem) vengai (Indian kino), vagai (Albizia lebbeck), neer maruthu (Arjun tree), panneer pushpam (Beach Gardenia).

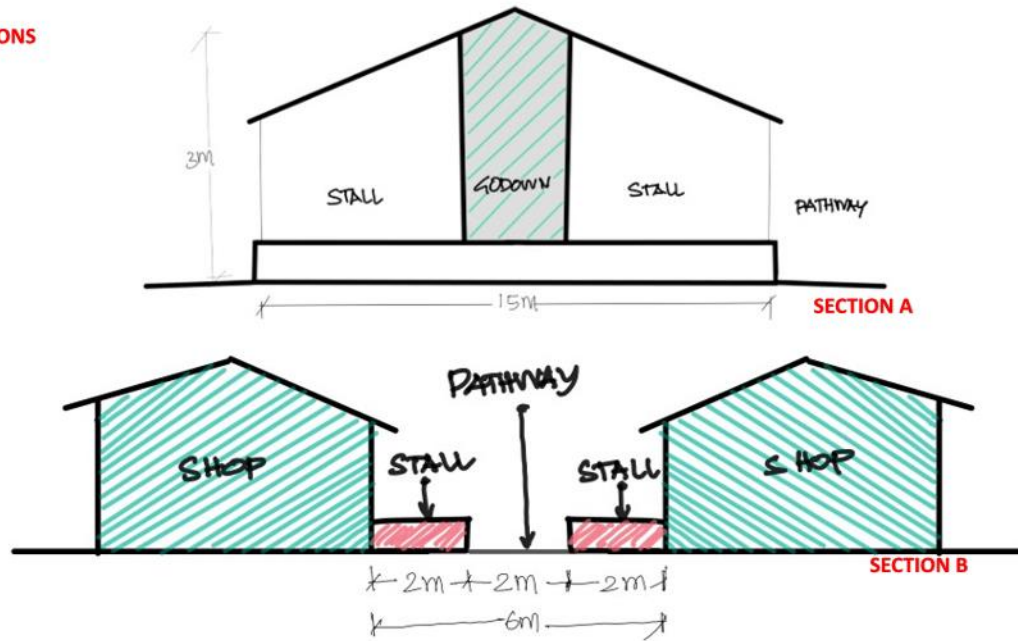
CIRCULATION: VEGETABLE MARKET



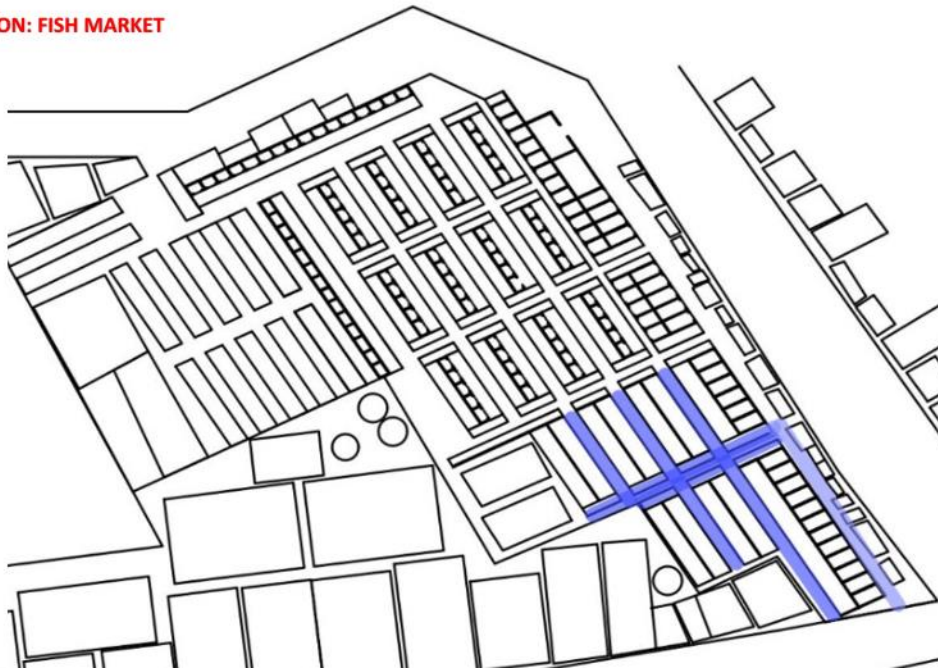
CIRCULATION NOW



SECTIONS



CIRCULATION: FISH MARKET



CIRCULATION: FISH MARKET



CIRCULATION: VENDORS



CIRCULATION: VENDORS



SERVICES SHOWING ELECTRICAL, GARBAGE AND STORAGE



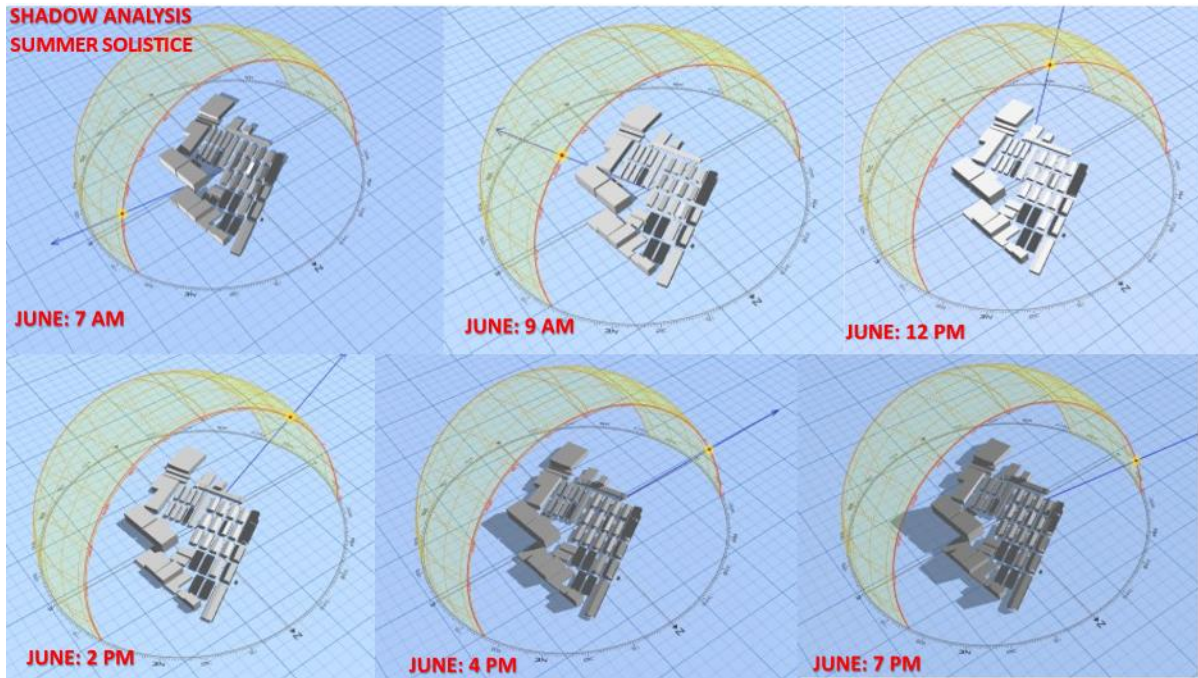
- ENTRY/EXIT
- TRANSFORMER
- SUB-ARTERIAL ROAD
- UNLOADING VEGETABLES
- WATER TANK
- PEDESTRIAN
- GARBAGE DISPOSAL
- UNLOADING MEAT

SWOT Analysis :

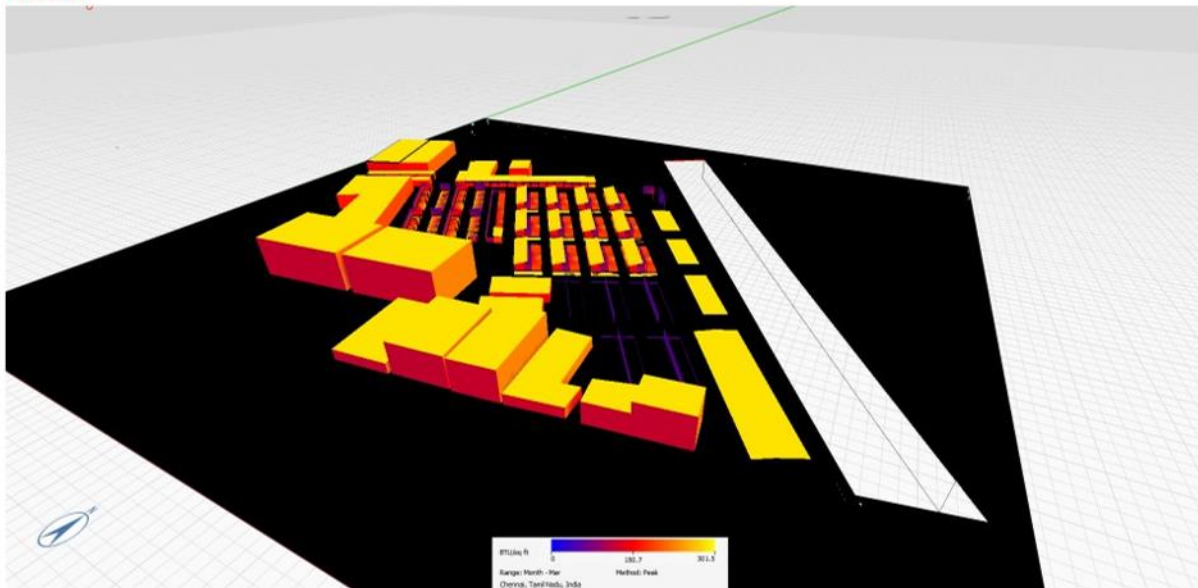
Strengths	Weakness
- Predominantly residential area, so the sustainability is more. - Fast changing area, so people adapt well to changes.	- Mixed residential area, so great congestion - Increased commercialization. - High rise, high dense new buildings.
Opportunities	Threats
- Opportunity to develop the market to suit the growing population in the area. - Possible to decongest the locality by providing better parking facilities.	- Unplanned growth may lead to deterioration. - Shady areas with illegal, unethical activities. - Mismanagement of bazaar has led to deterioration of the structures.



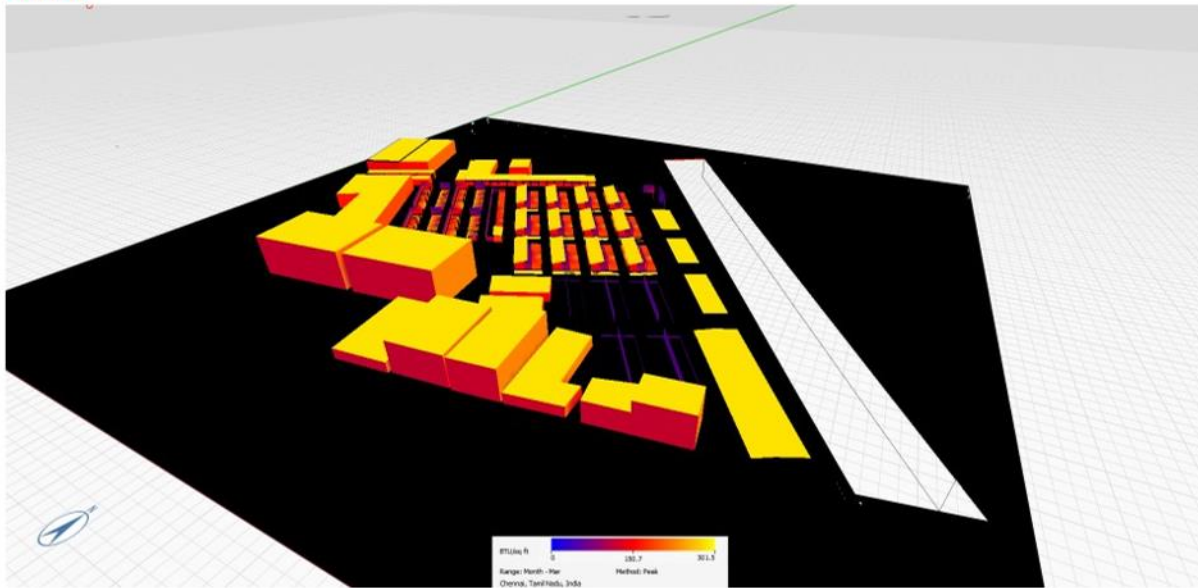
SHADOW ANALYSIS
SUMMER SOLISTICE



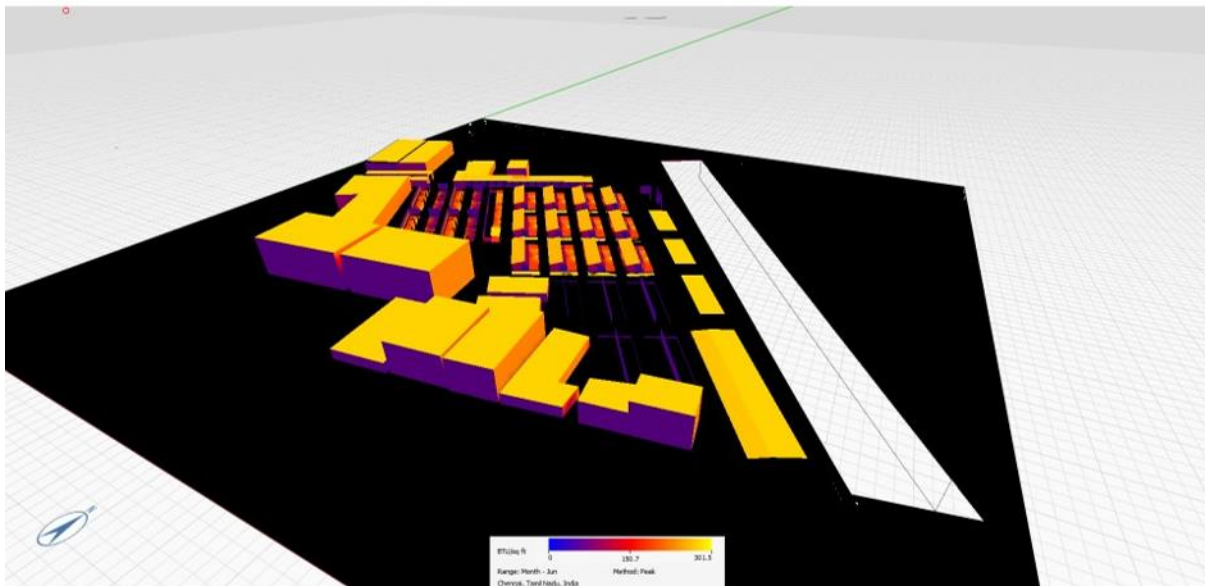
RADIATION ANALYSIS
MARCH



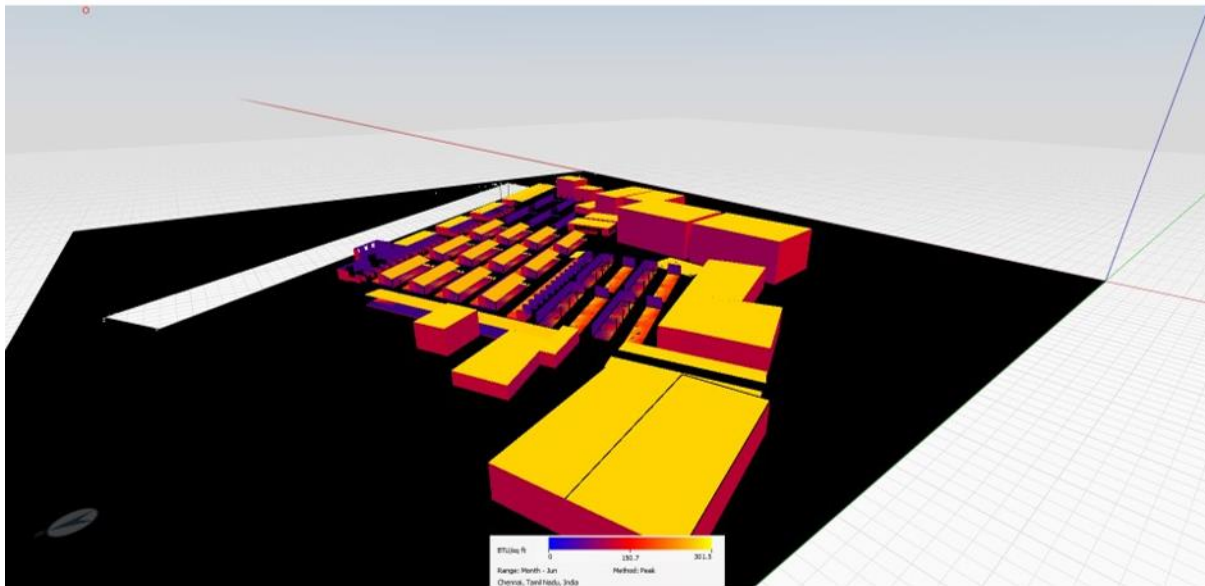
RADIATION ANALYSIS **MARCH**



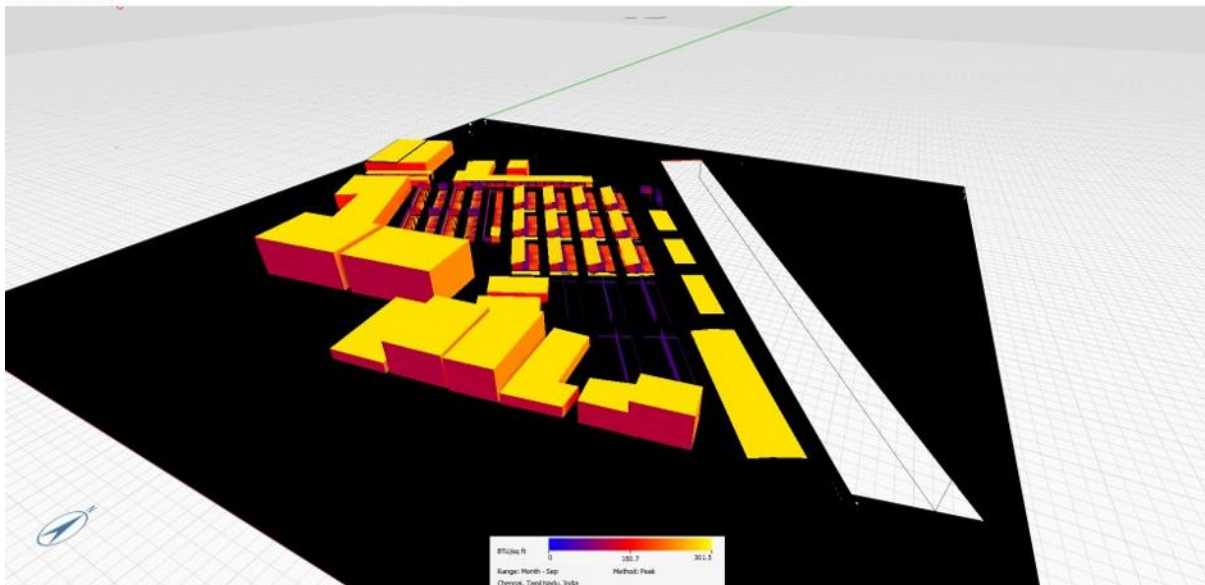
JUNE

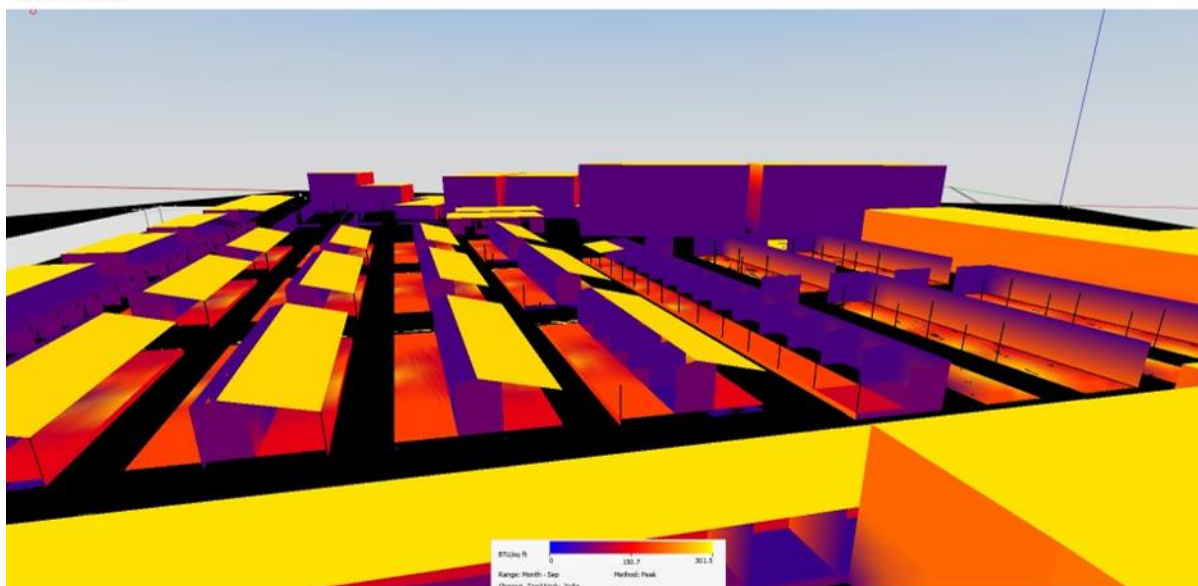


JUNE



SEPTEMBER





COLD STORAGE

- Saidapet market is the largest market of vegetables in the south chennai. I
- Fruits and vegetables losses about 10% to 15%. Most of the problems relating to the marketing of fruits and vegetables can be traced to their perishability. Perishability is responsible for high marketing costs, market gluts, price fluctuations and other similar problems.
- At low temperature, perishability is considerably reduced and the shelf life is increased and thus the importance of cold storage or refrigeration.
- With a view to ensuring the observance of proper conditions in the cold stores and to providing for development of the industry in a scientific manner, the govt of India and the ministry of agriculture promulgated an order known as "Cold Storage Order, 1964" under Section 3 of the Essential Commodities Act, 1955.
- A cold storage facility accessible to them will go a long way in removing the risk of distress sale to ensure better returns.

Status of Cold storage and its potential in India

At present, the market generates some 150 tons of organic waste every day that gets mixed and dumped with the plastic and inert material at dump yards. And, not all the waste generated every day is cleared, littering the market with eyesores and leading to foul smell

The lack of cold storage and cold chain facilities are becoming major bottlenecks in tapping the potential. The cold storage facilities now available are mostly for a single commodity like potato, orange, apple, grapes, pomegranates, flowers, etc. which results in poor capacity utilization.

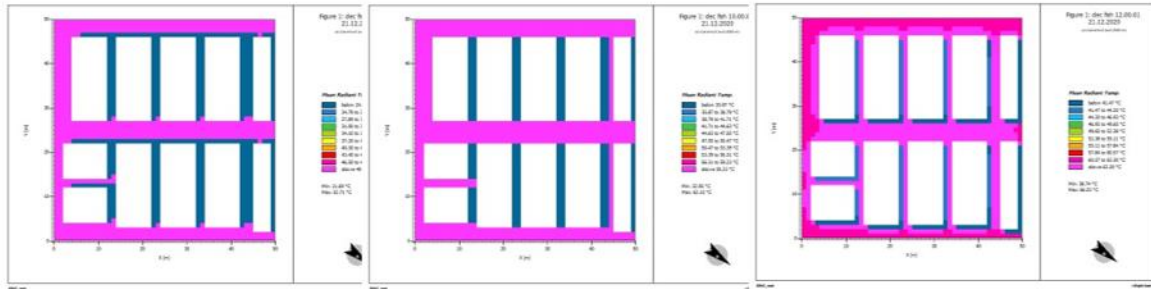
The low temperature necessary for preservation depends on the storage time required often referred to as short or long term storage and the type of product.

In general, there are 2 groups of products:

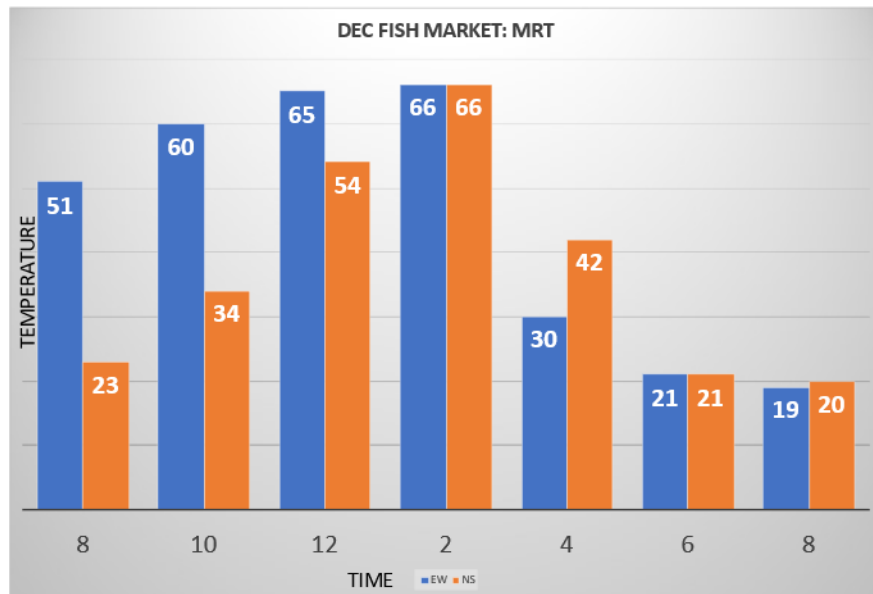
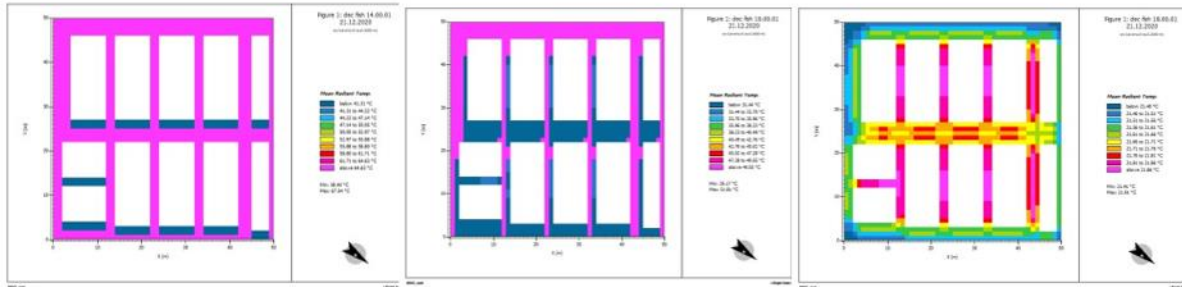
1. Foods that are alive at the time of storage, distribution and sale e.g. fruits and vegetables,
2. Foods that are no longer alive and have been processed in some form e.g. meat and fish products,

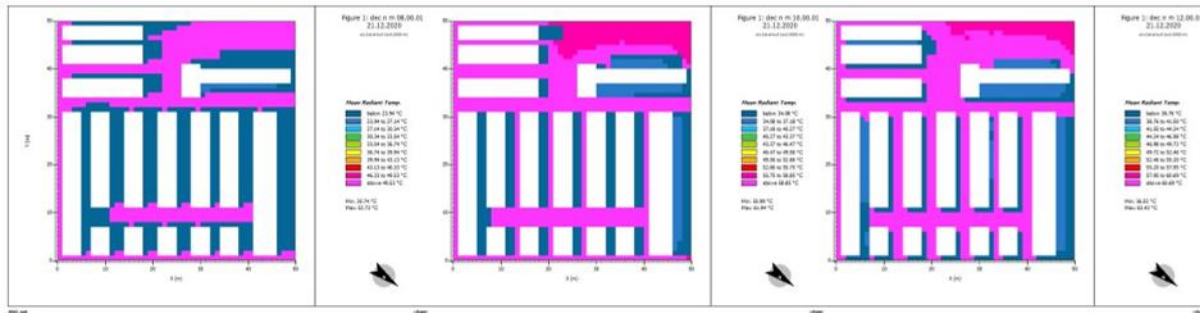
- Preservation of non -living foods is more difficult since they are susceptible to spoilage.
- The problem is to preserve dead tissues from decay and putrefaction.
- Long term storage of meat and fish product can only be achieved by freezing and then by storing it at temperature below -15°C .
- Only certain fruits and vegetables can benefit from freezing.
- However, for fruits and vegetables one should be very careful about the recommended storage temperature and humidity a deviation from which will have adverse effect on the stored product leading to even loss of the entire commodity



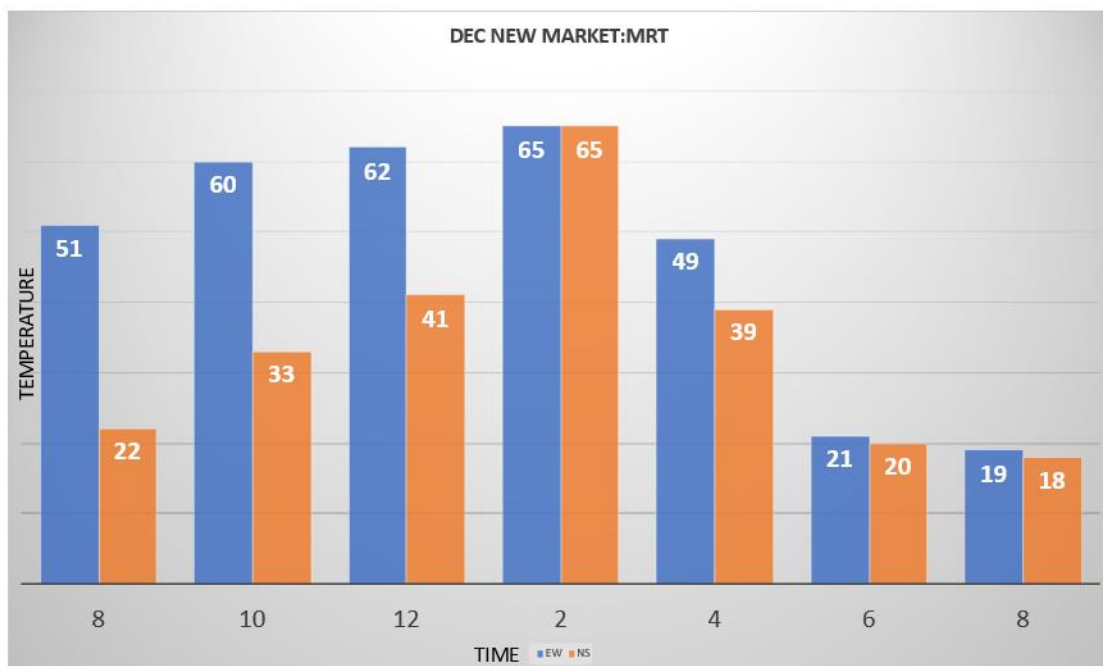
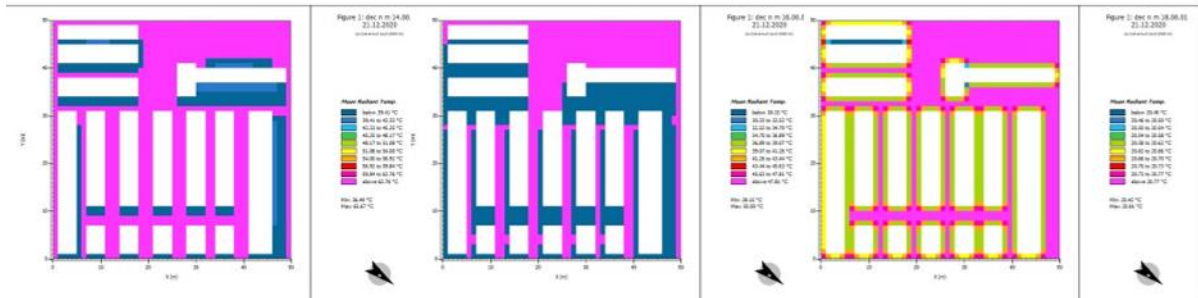


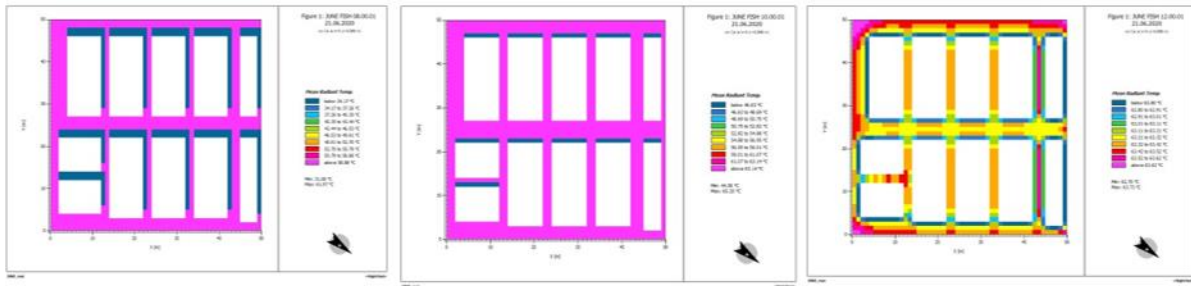
DEC FISH MARKET:MRT



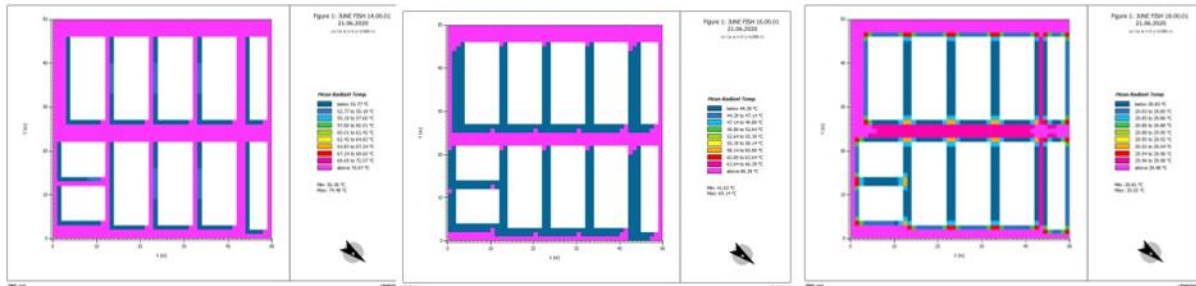


DEC NEW MARKET:MRT



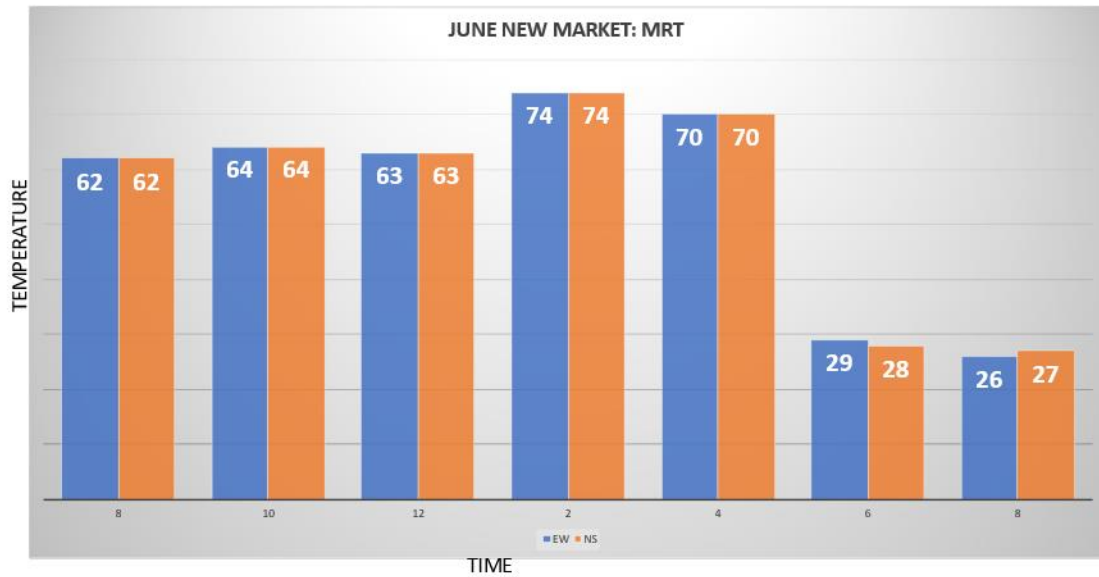


JUNE FISH MARKET:MRT



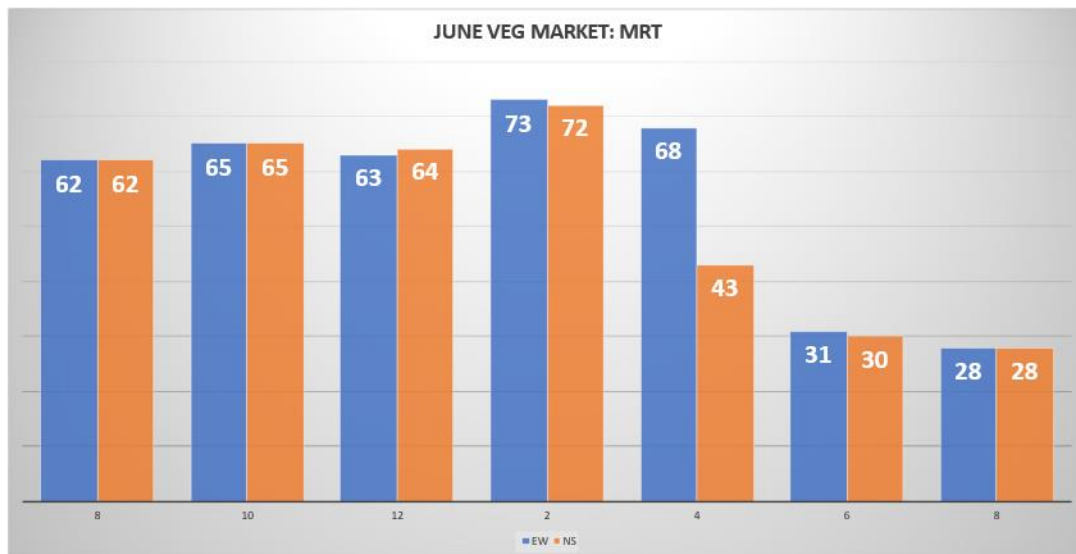


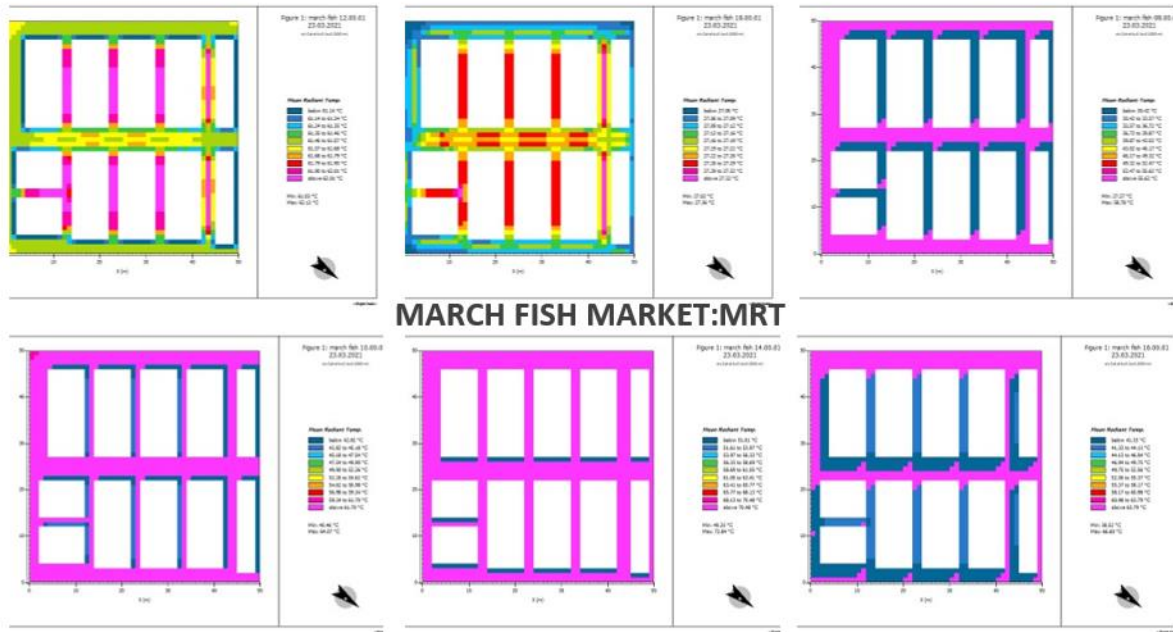
JUNE NEW MARKET: MRT





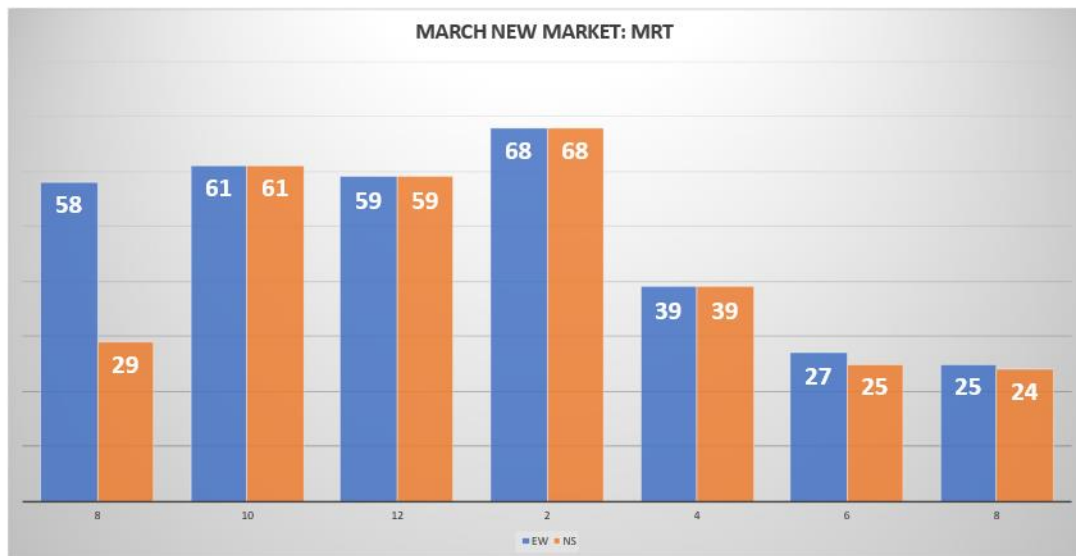
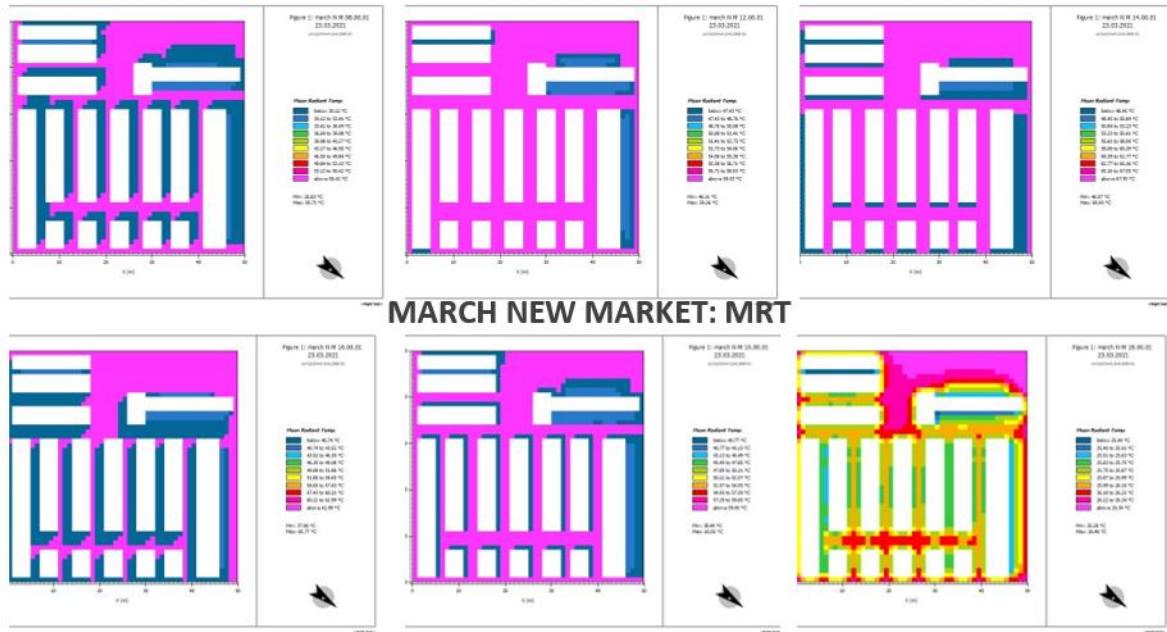
JUNE VEG MARKET: MRT

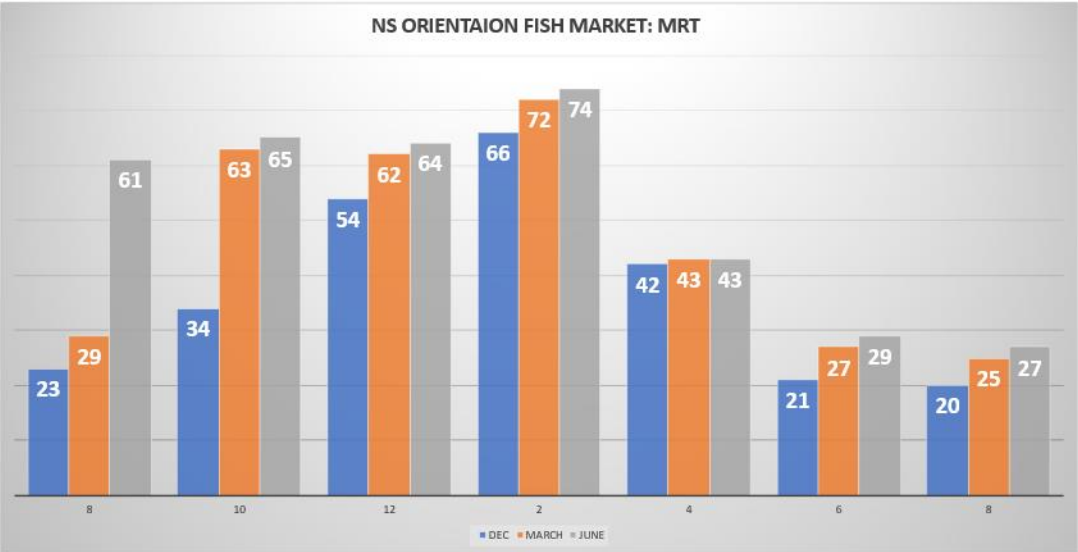
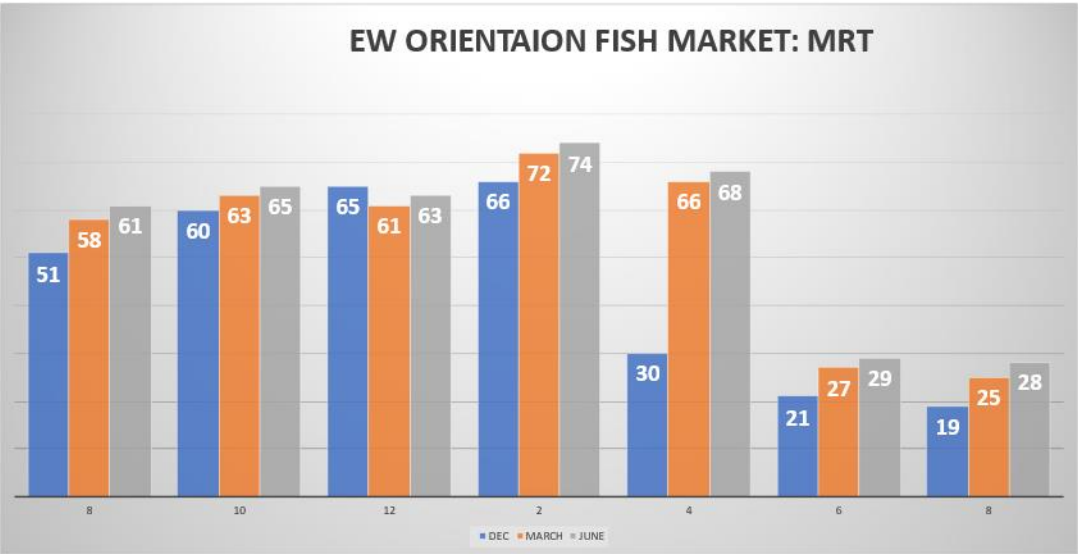




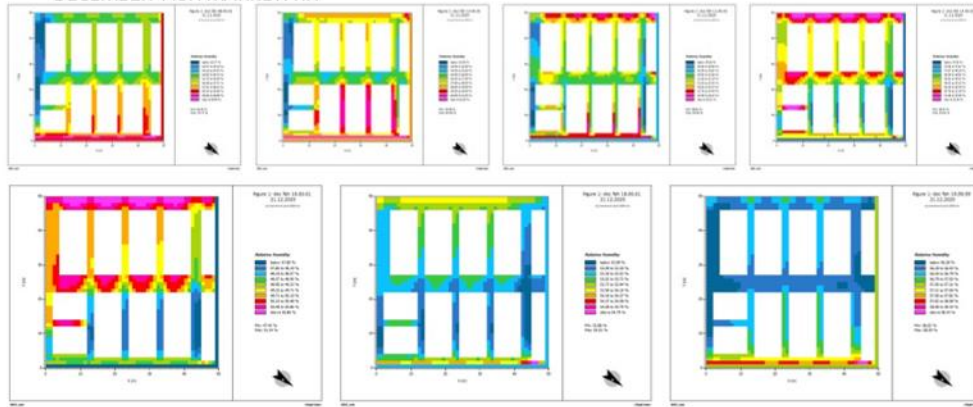
MARCH FISH MARKET:MRT



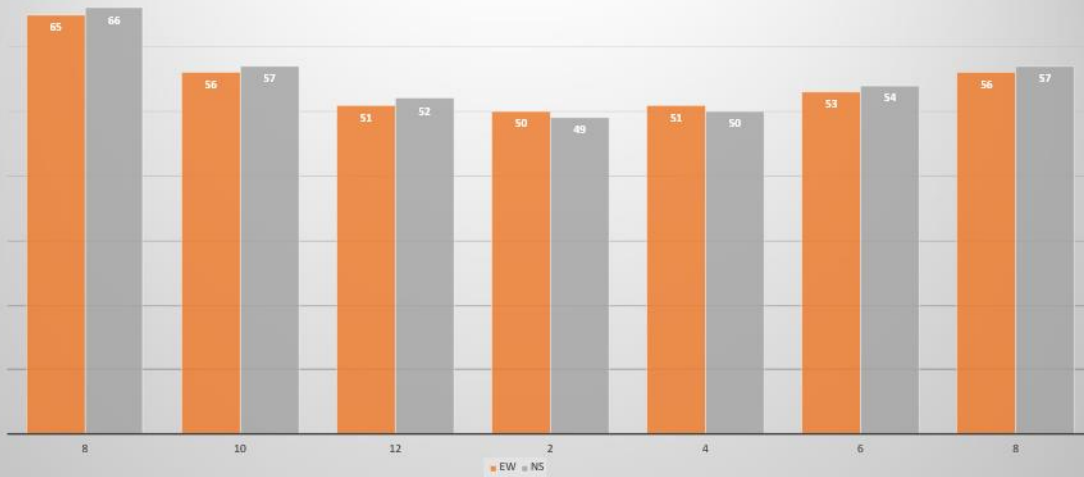




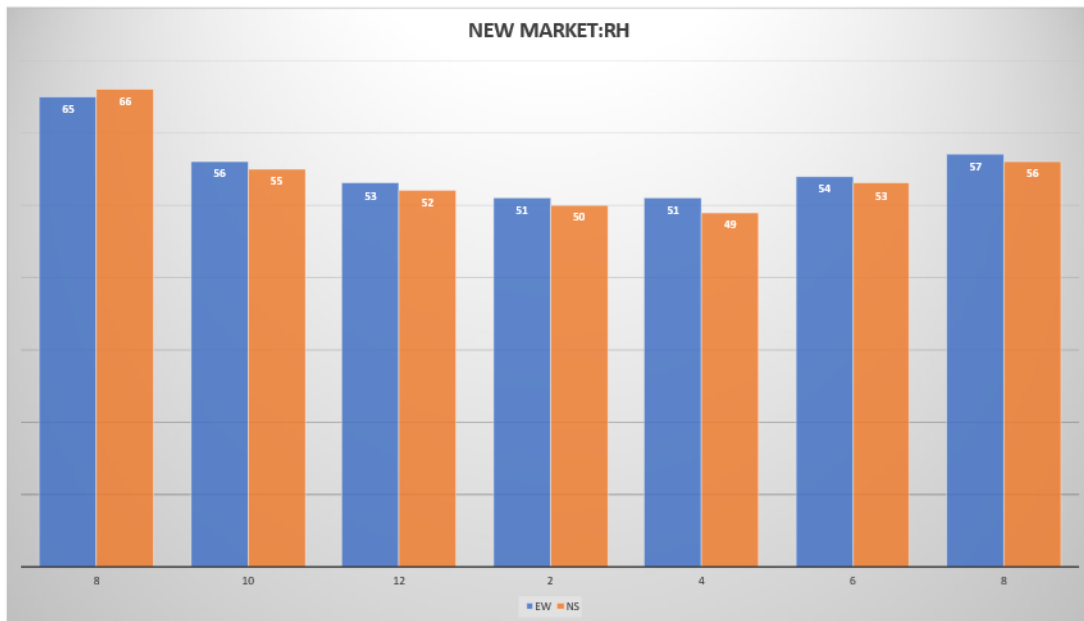
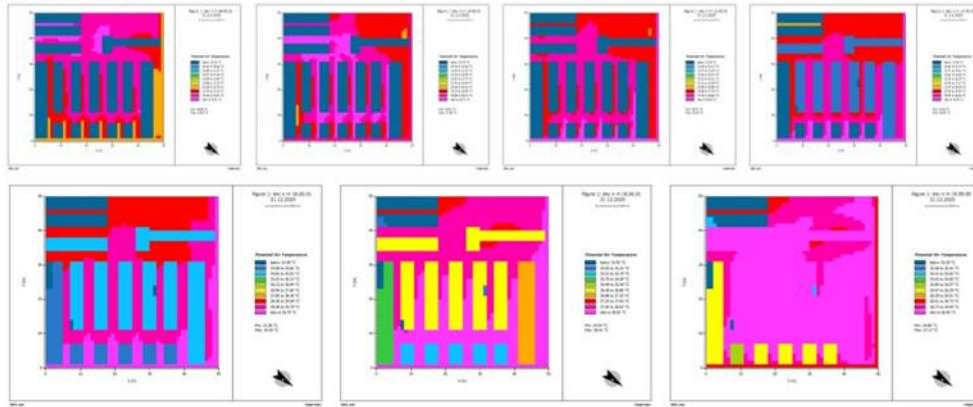
DECEMBER FISH MARKET: RH



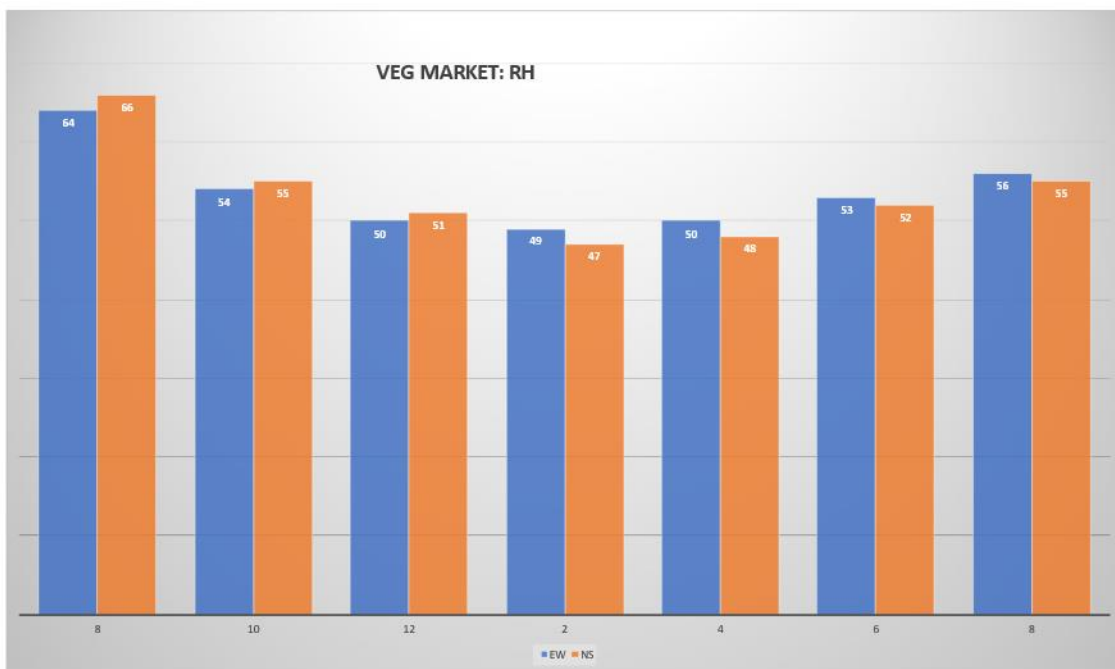
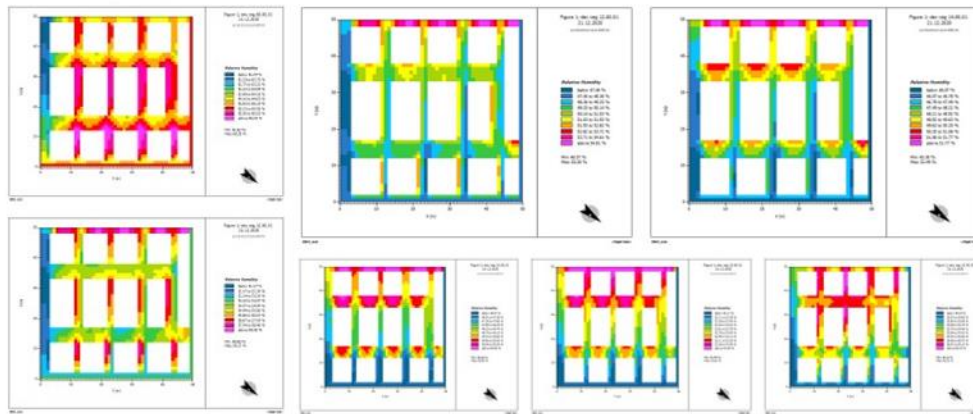
DECEMBER FISH MARKET: RH



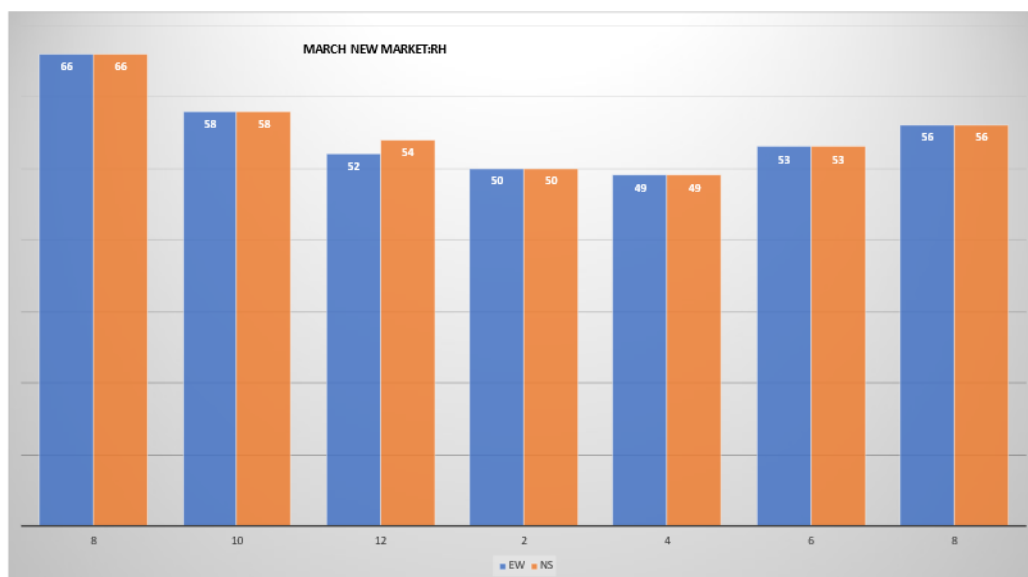
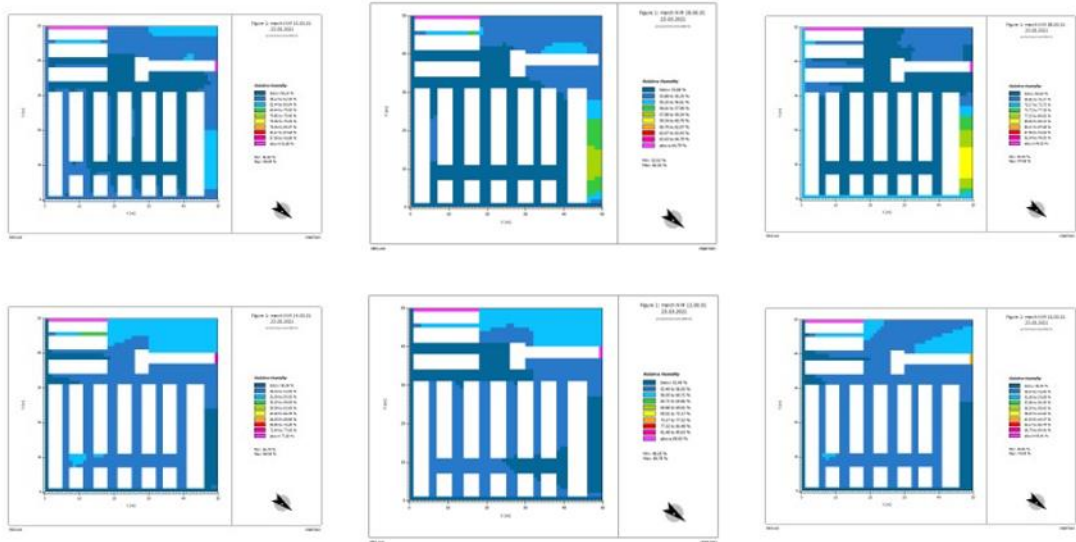
NEW MARKET:RH



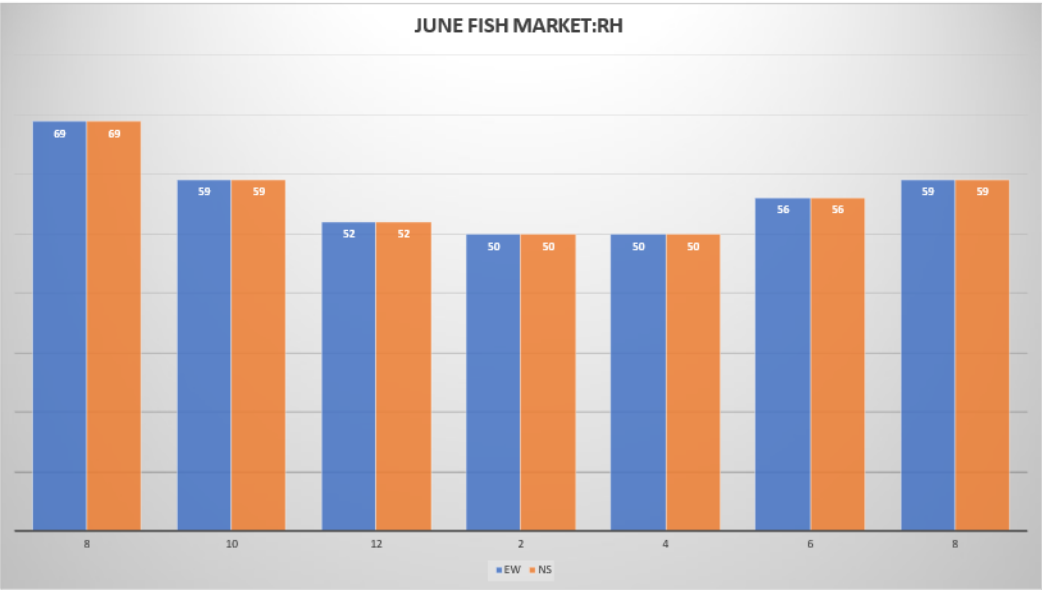
VEG MARKET: RH

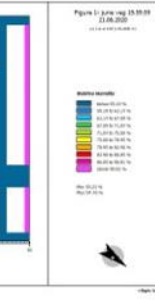
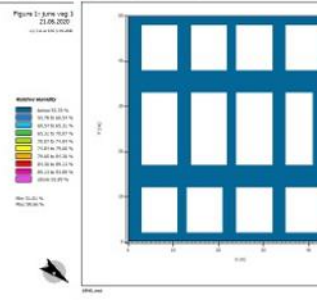
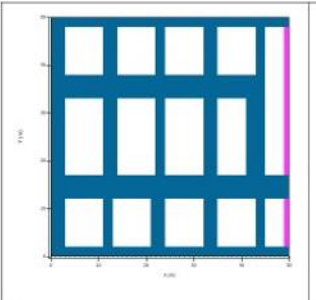
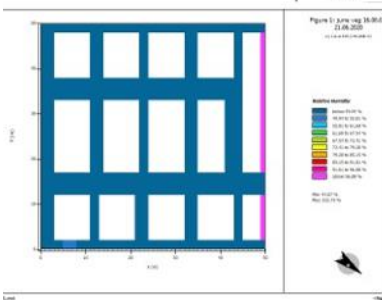
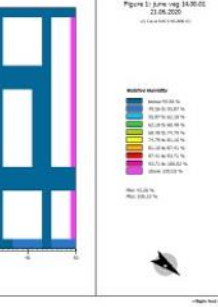
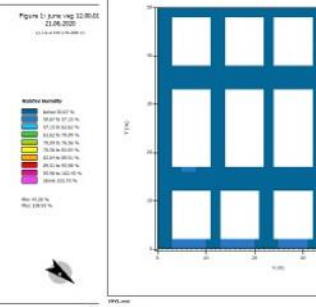
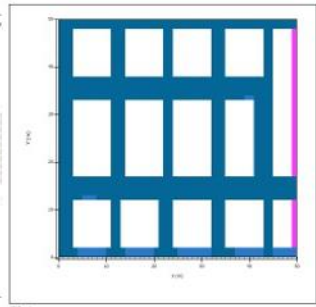
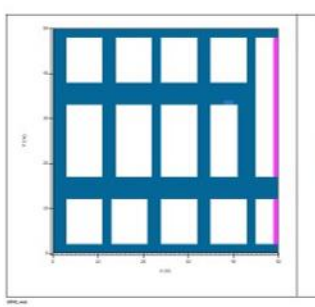
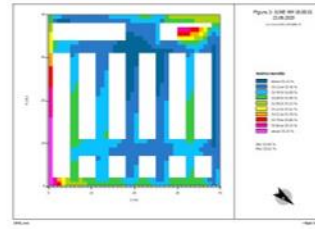
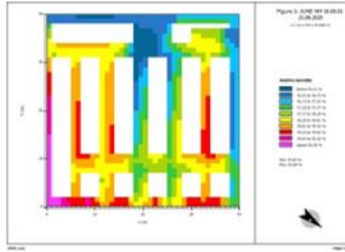
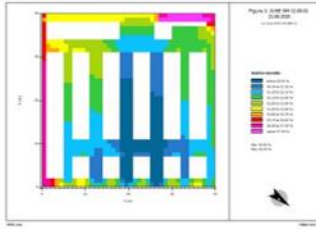
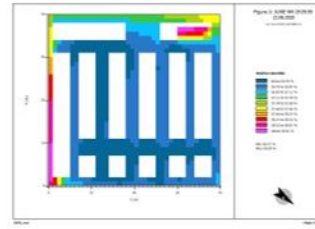
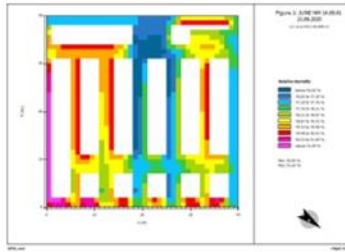


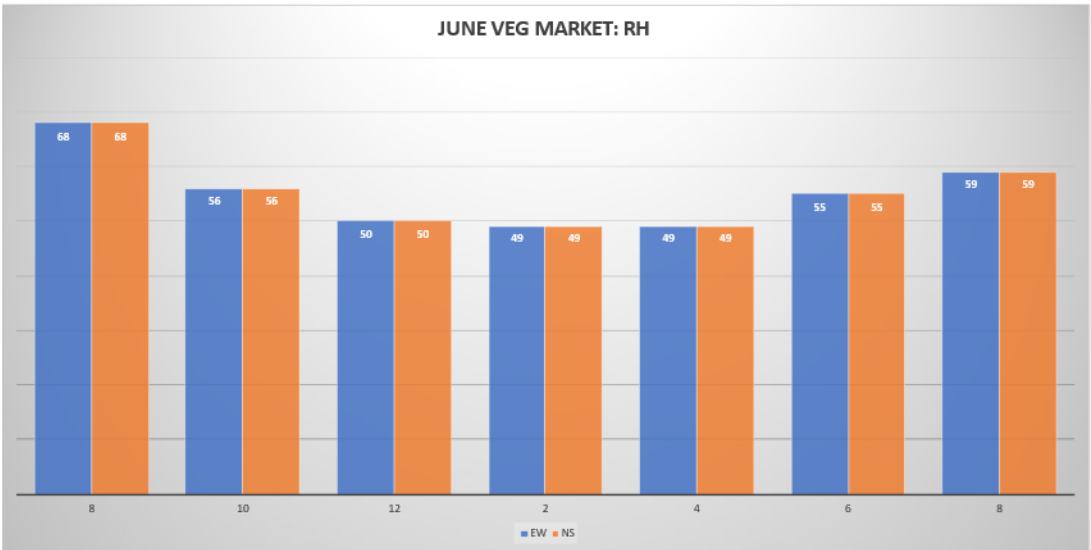




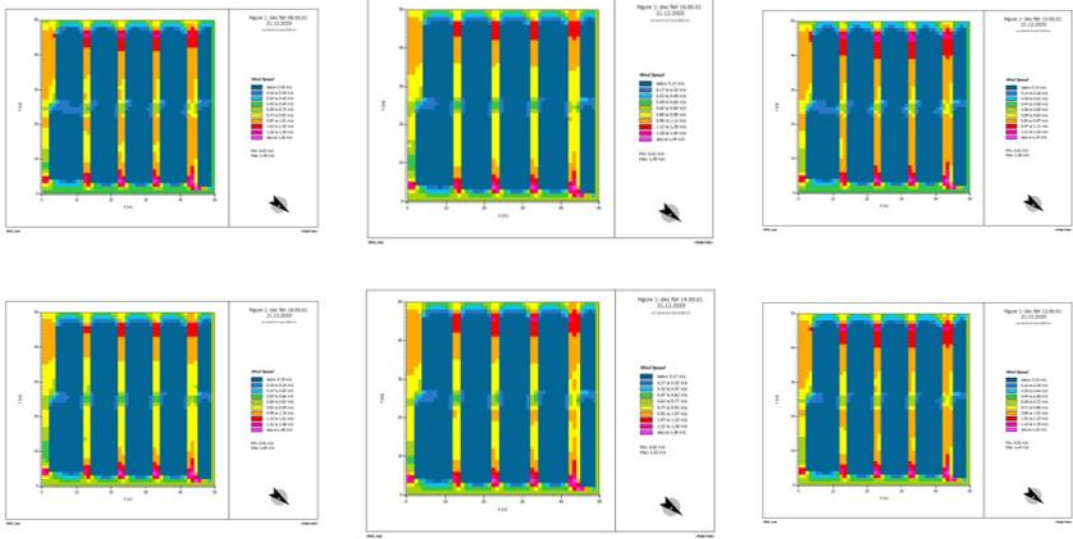
JUNE FISH MARKET:RH

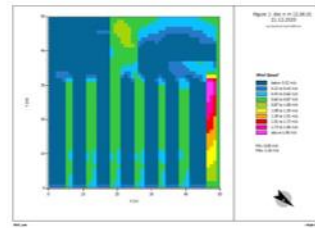
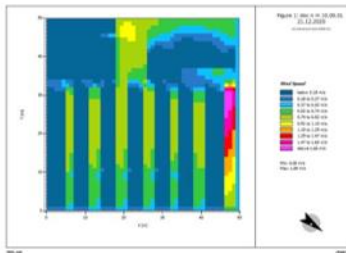
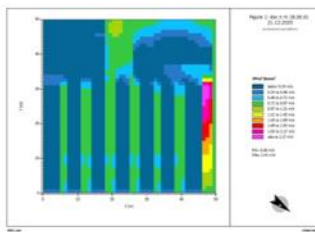
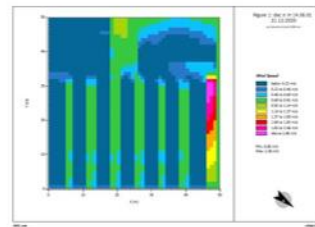
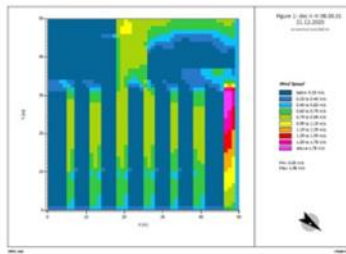
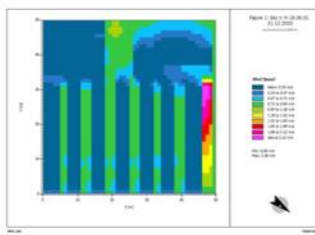
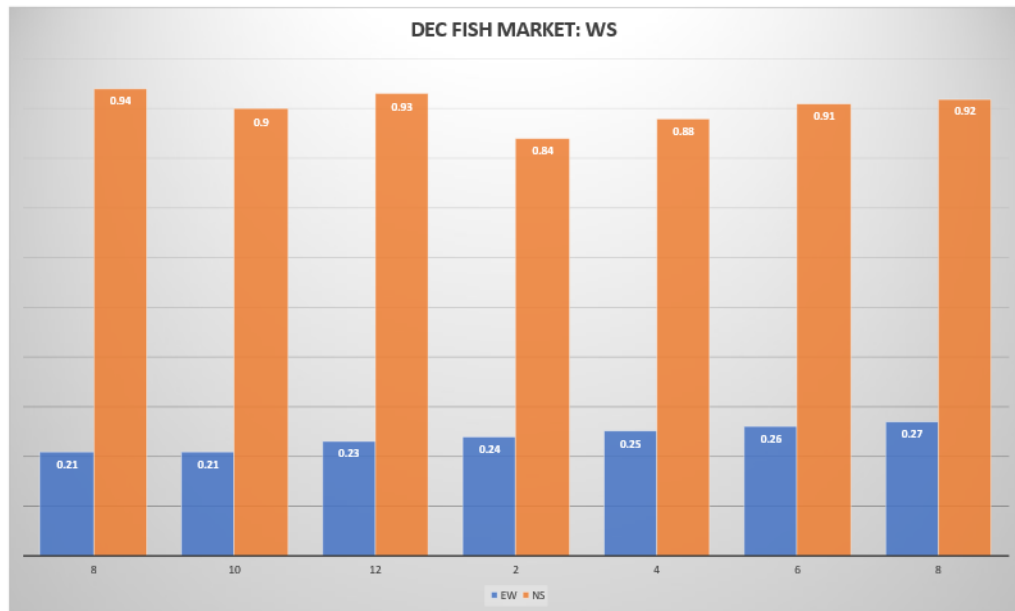


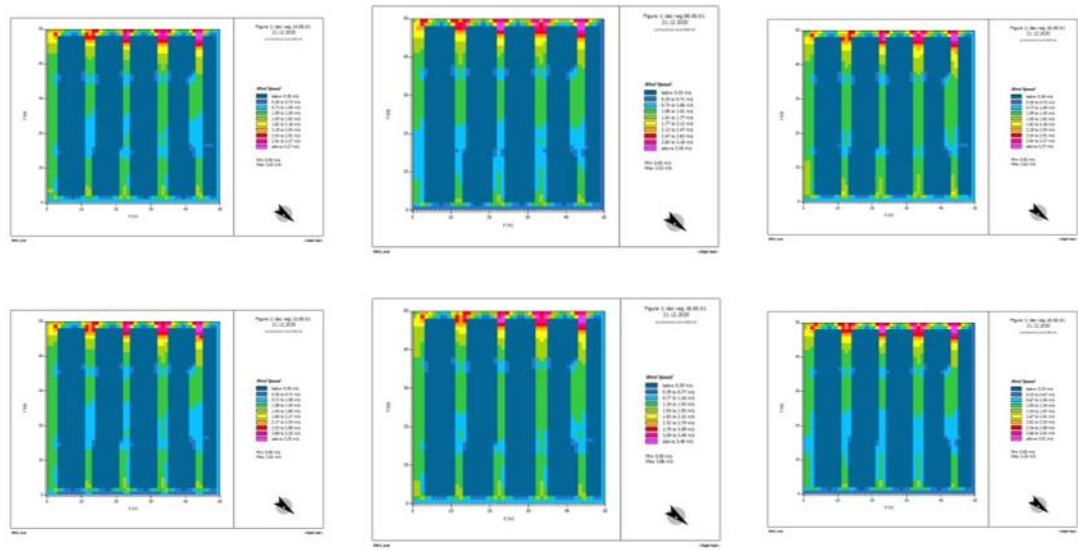
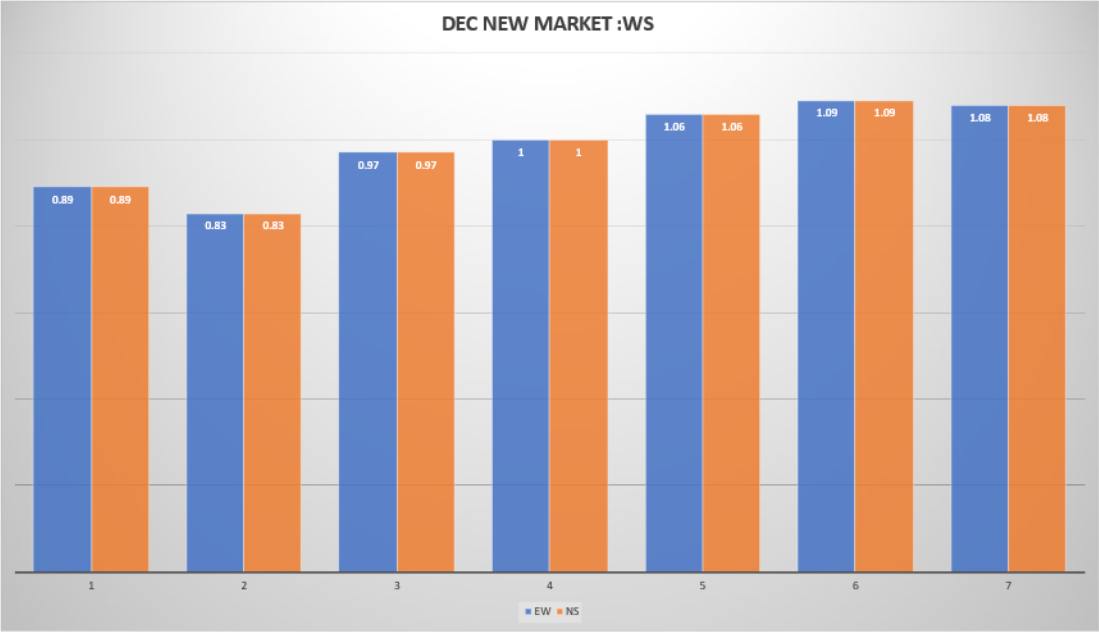


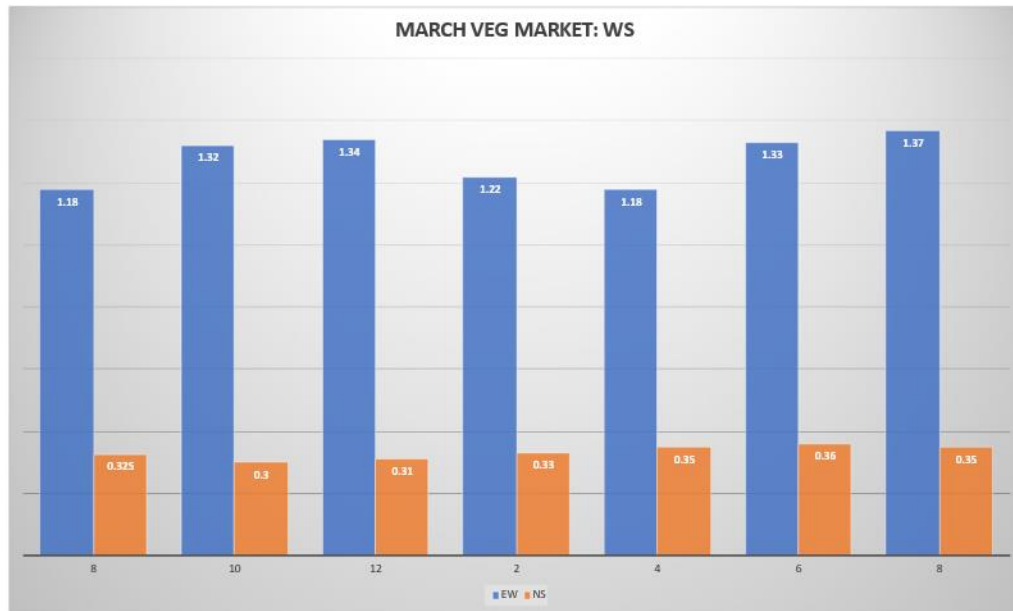
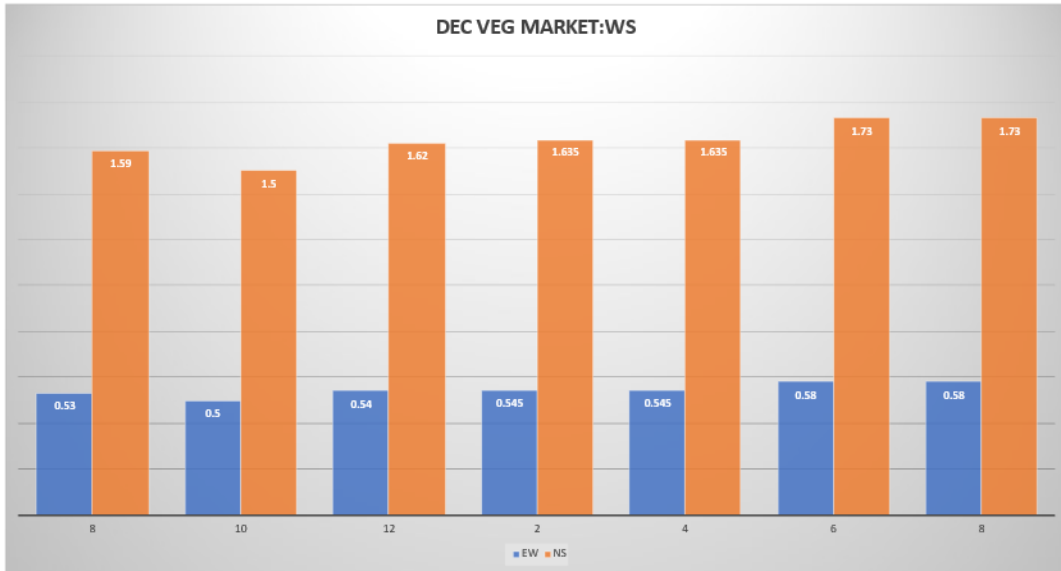


DEC FISH MARKET: WS













**NEW
MARKET**

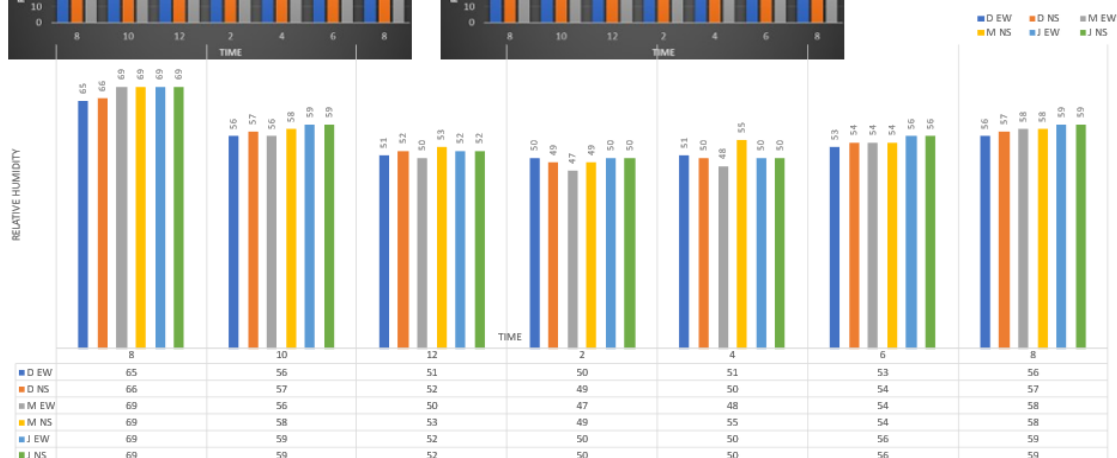


**VEG
MARKET**

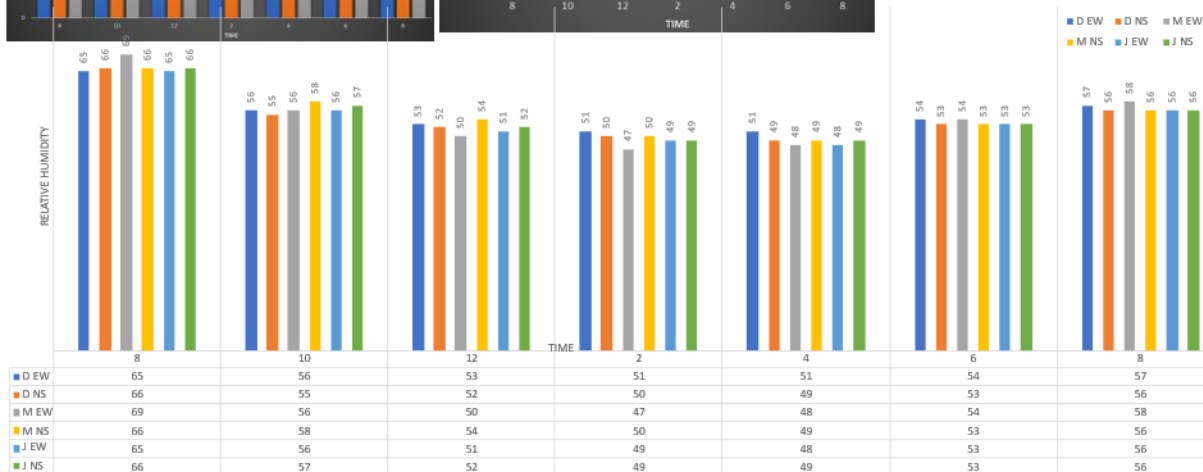


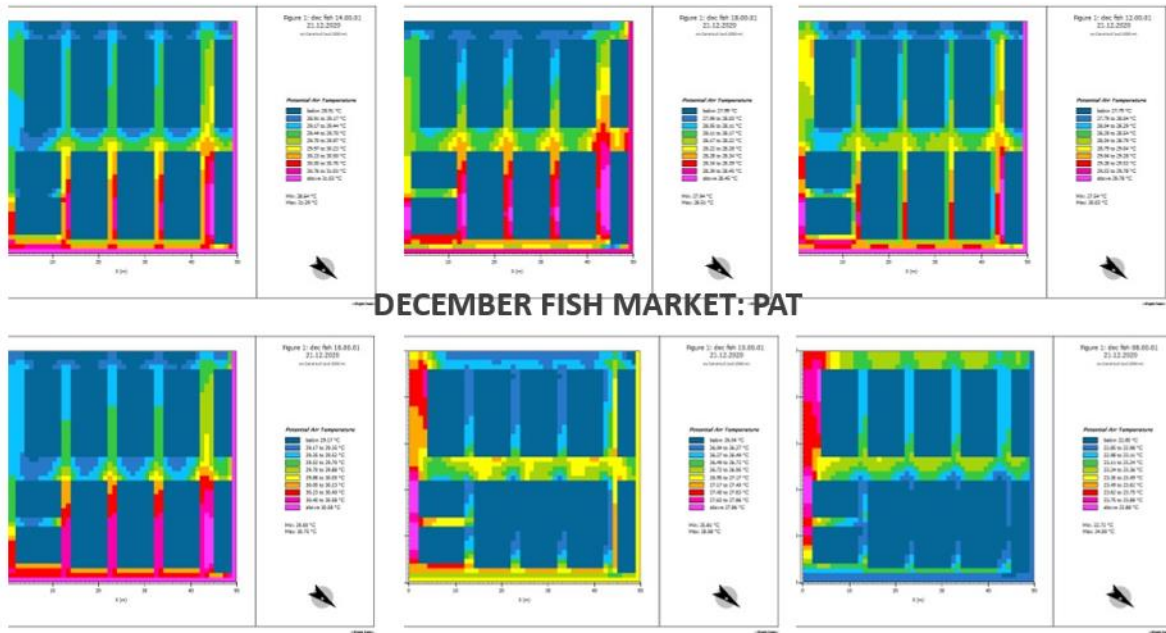


FISH MARKET

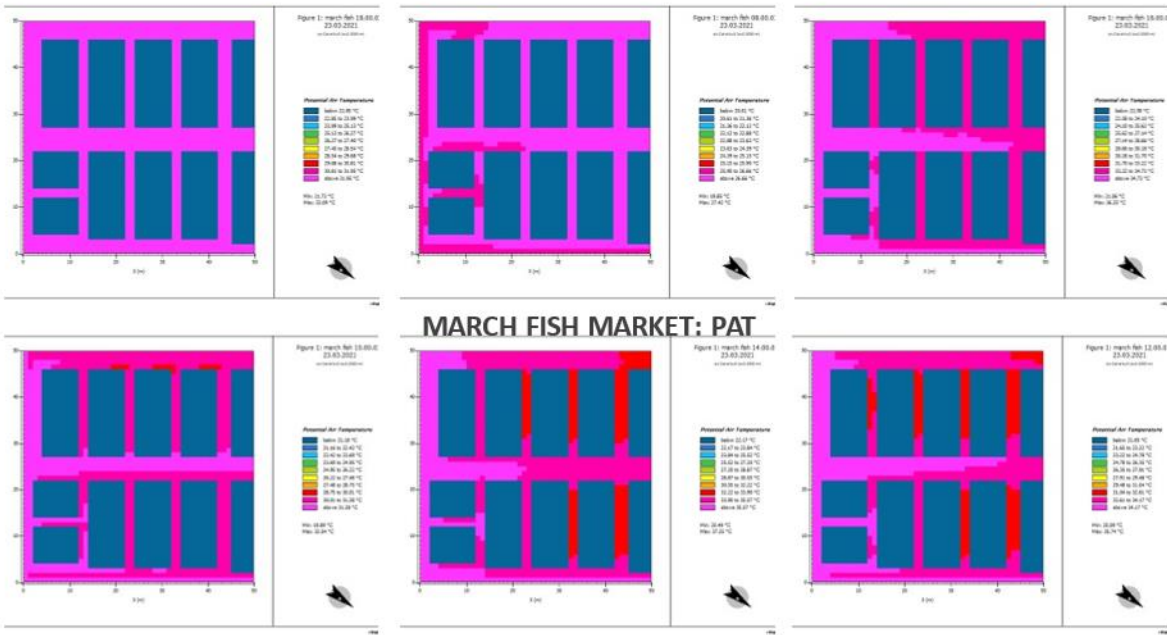
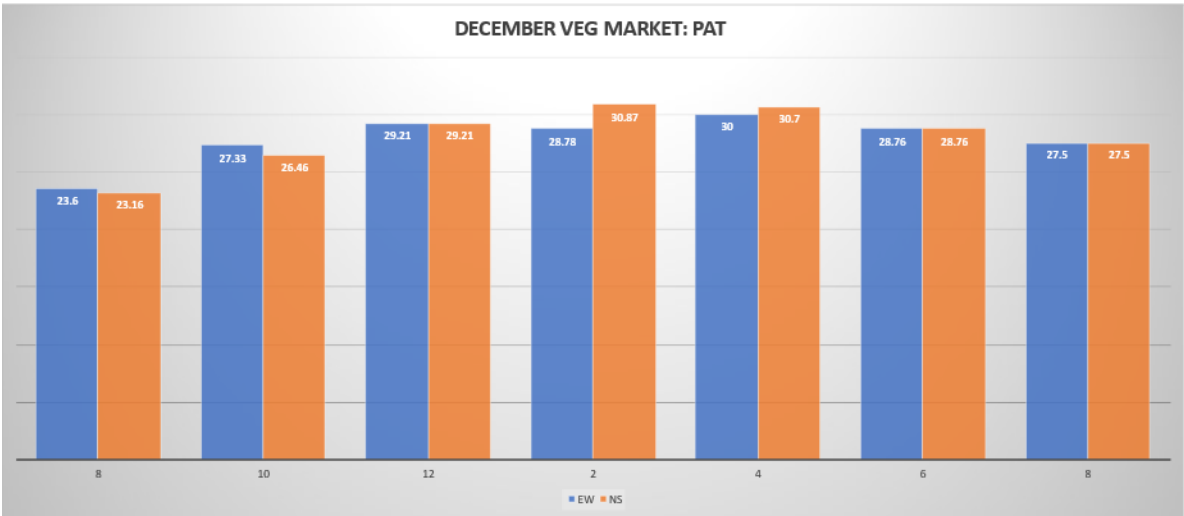


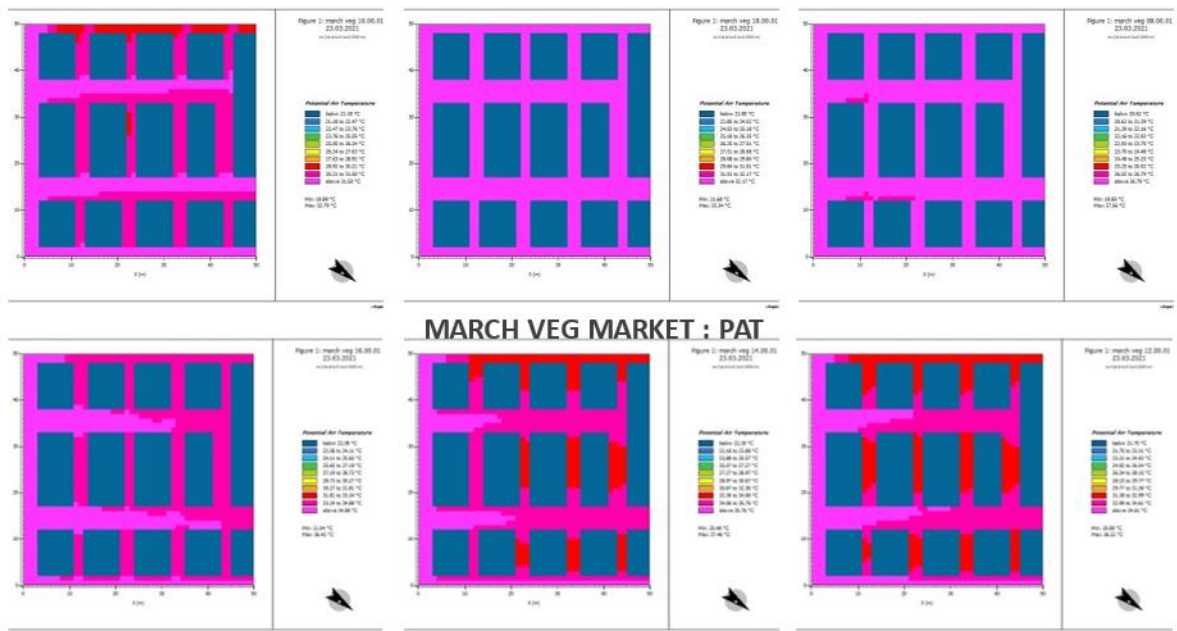
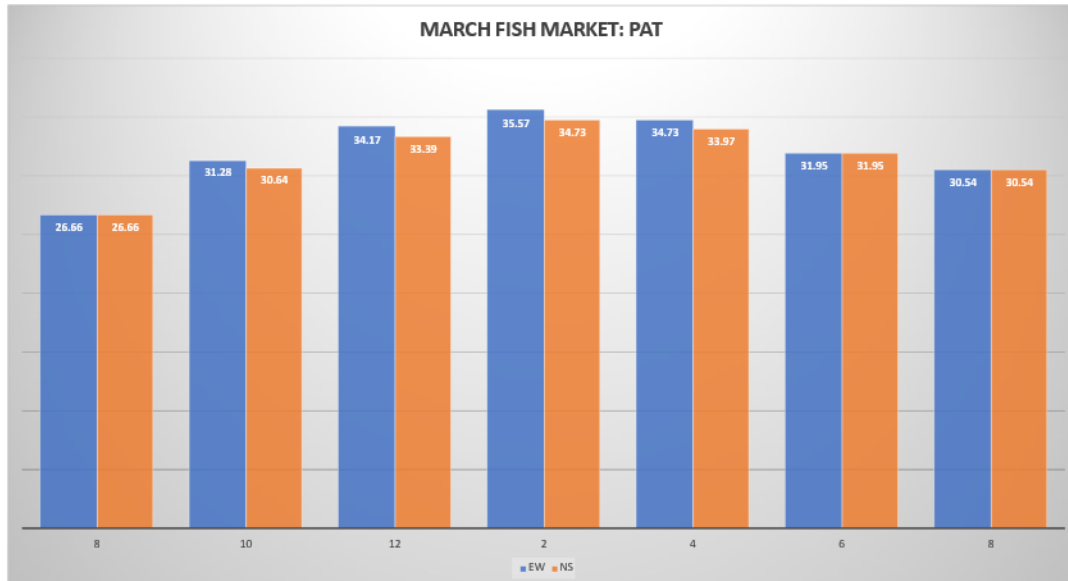
NEW MARKET

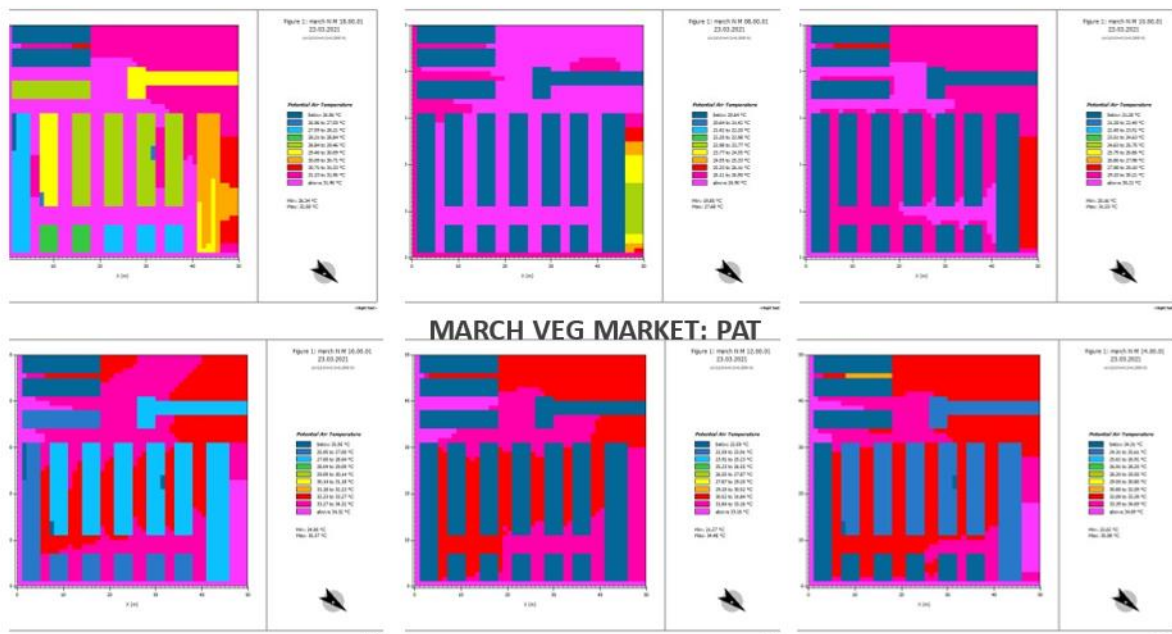
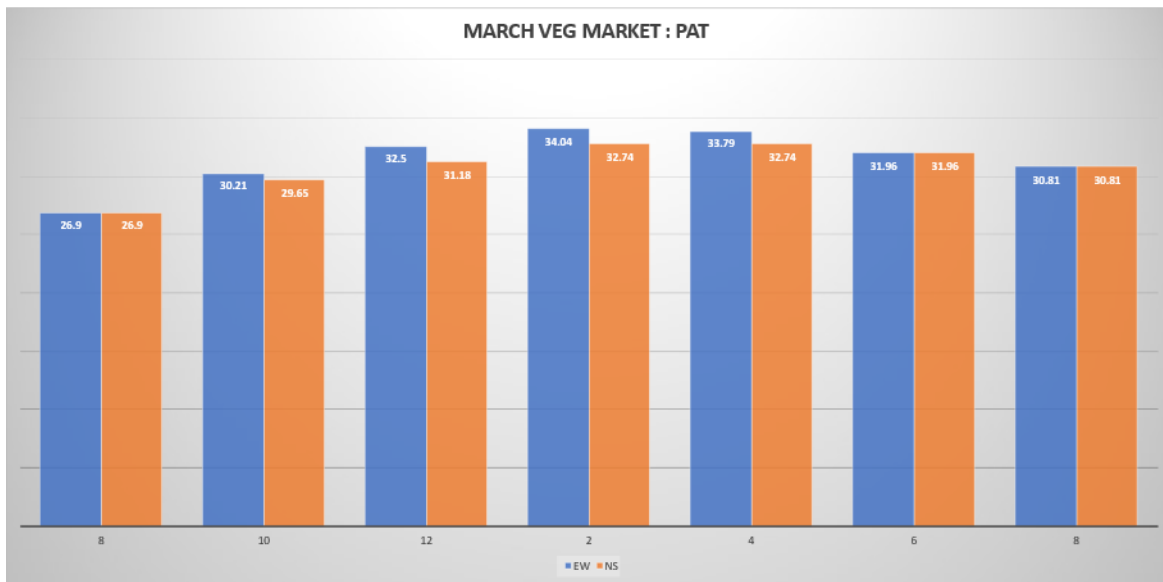


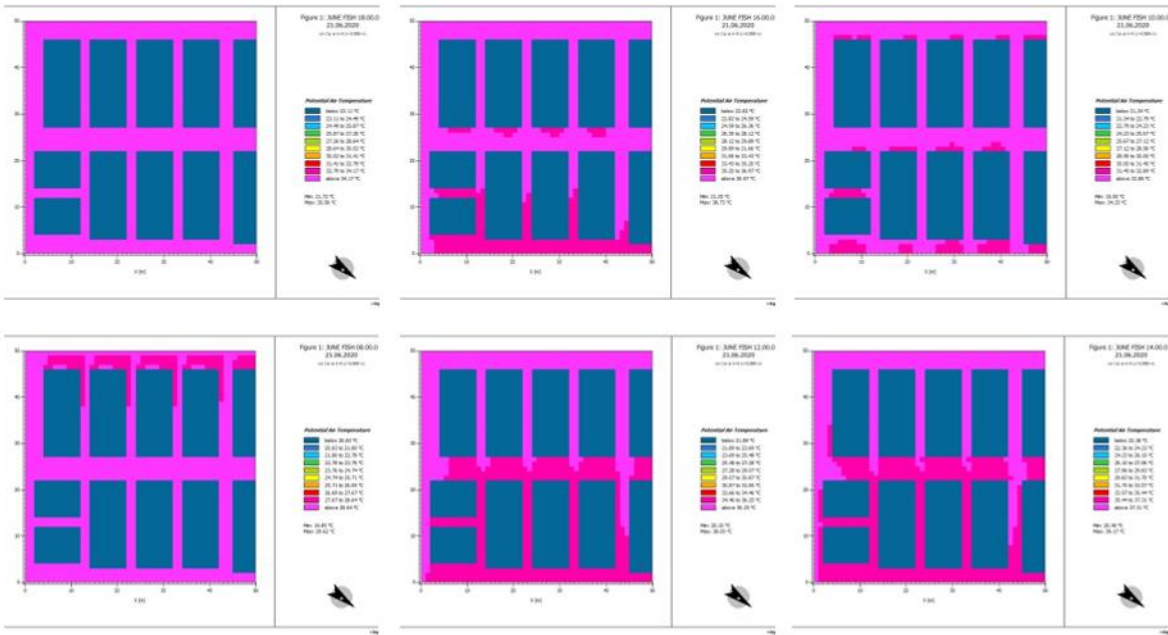
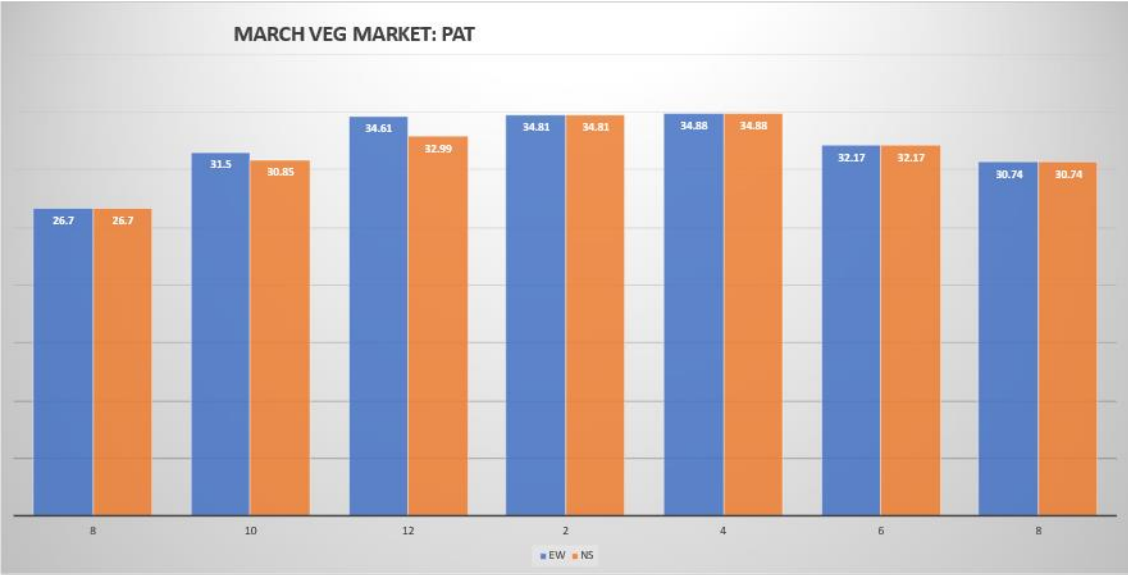






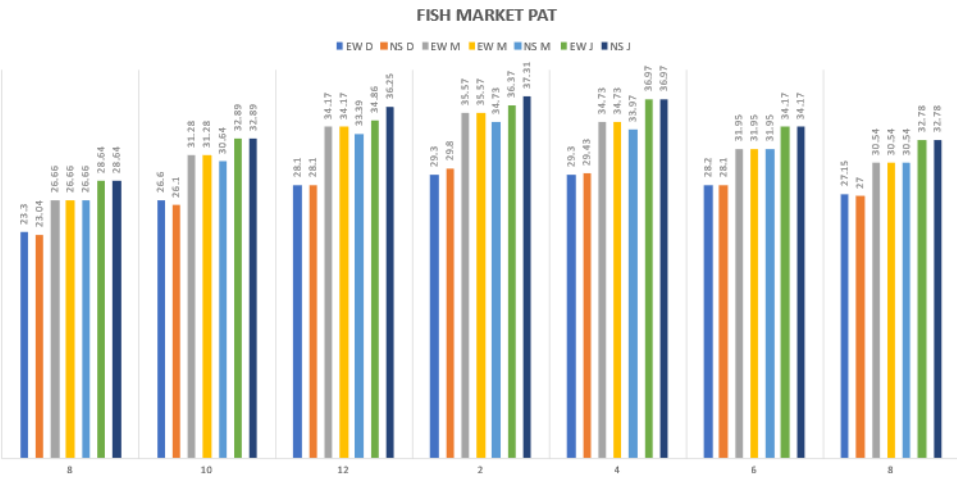
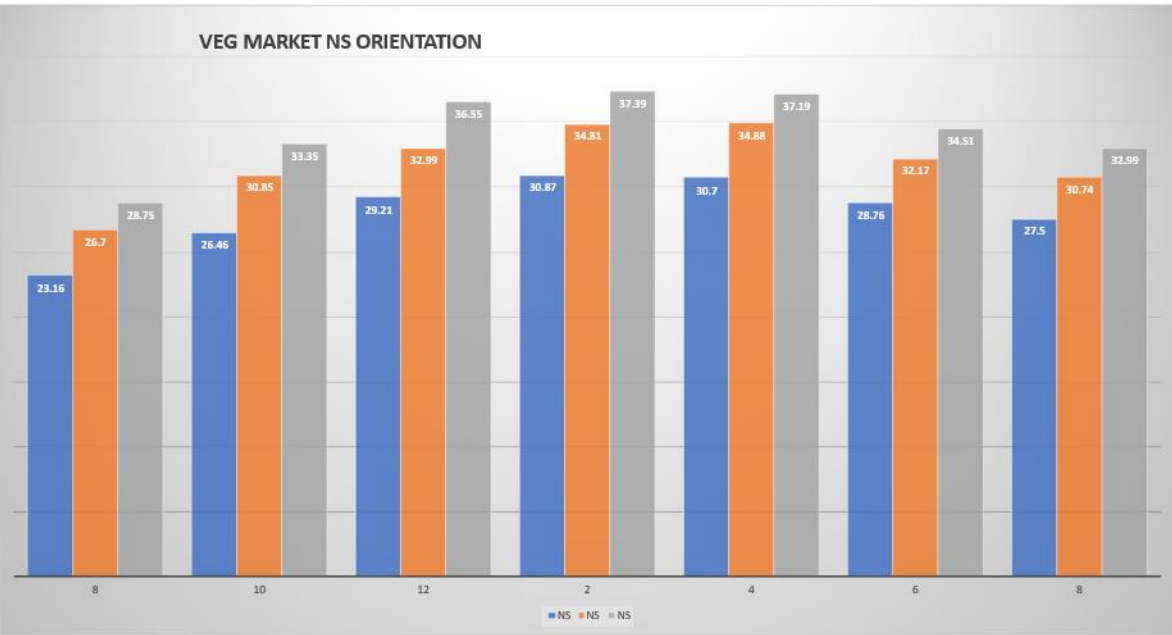


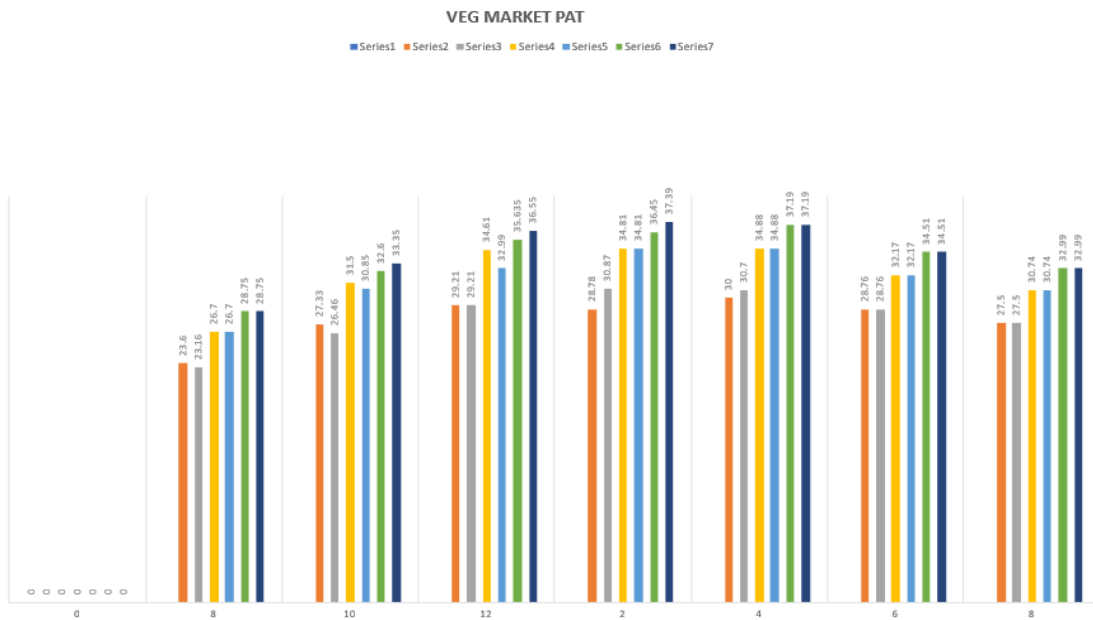












INFERENCE:

The main aim of this analysis is to investigate the relationship between existing market design, and outdoor comfort in 3 zones with different morphologies including wide, and narrow street width between buildings.

The study was mainly concentrated on the warm season which is June but a comparison with the thermal comfort conditions in the month of March and December is also made to know the transition.

Air temperature, wind speed, mean radiant temperature (MRT), and the relative humidity (RH) are simulated using ENVI-met to highlight the strengths and weaknesses of the existing market design. An analysis of the distribution of MRT in the areas showed that the area in EW orientation had the highest frequency of high MRTs and the lowest frequency were recorded on NS street orientation. The study illustrates that areas with low-rise buildings especially in EW orientation lead to more stressful spaces than areas with high-rise buildings. However at solar noon, high-rise buildings alone cannot create shade due to the high solar elevations. This implies that additional measures, such as the use of vegetation or shading devices, must be taken to reduce the radiant heat load at lower latitudes at noon. In warm and humid regions, it has been found that on average about 80% of the total cooling effect of the sites is contributed by tree shading. It is also shown that the use of dense trees helps to enhance the thermal comfort conditions which reduces the heat. And also vegetation had positive effect the wind ventilation on the site. And also the analysis shows that the provision of shade is a more efficient way to reduce MRT.

