The SUSTAINABLE LOGISTICS

MAY 2022 Francesca Mellano fra.mellano@gmail.com

SUMMARY

- CONTEXT
- SUSTAINABLE LOGISTICS DEFINITION, CHALLENGES, BENEFITS
- EU REGULATIONS
- AREAS OF SUSTAINABLE LOGISTICS :
 - DISTRIBUTION AND TRANSPORT
 - DIGITALIZATION AND DATA MANAGEMENT
 - WAREHOUSING
 - WASTE MANAGEMENT AND REVERSE LOGISTICS
 - PACKING
- CASE STUDIES
- CONCLUSIONS

THE CRISIS OF SUPPLY CHAIN IN 2020:

- COVID19 \rightarrow UNCERTAINTY
- ECOMMERCE BOOM \rightarrow RAISE OF DEMAND
- DIFFICULTIES OF PRODUCTION
- GEO-POLITICAL TENSIONS, CLIMATE CRISIS, RAISE OF PRICES
- LACK OF ENERGY SOURCES AND PERSONNEL

 \rightarrow CRISIS OF THE TRANSPORT INDUSTRY : LACK OF CONTAINERS, HIGH PRICES



Global container freight rate index from January 2019 to March 2022(in U.S. dollars)







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ALL THIS LEAD TO .. RE-ORGANIZATION AND NEW PRIORITIES! NEED FOR NEW AND DIFFERENT INVESTMENTS

- NEW RENEWABLE ENERGY SOURCES
- MORE SUSTAINABLE PRACTICES
- GREEN TECHNOLOGIES
- DIGITALIZATION OF THE PROCESSES



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SUSTAINABLE LOGISTICS AND SUPPLY CHAIN

PRACTICES AND PROCESSES AIMED TO ANALYZE AND RE-ELABORATE ALL ACTIVITIES OF THE SUPPLY CHAIN (FROM THE SUPPLY OF RAW MATERIALS, TO TRANSFORMATION, STORAGE, PACKAGING, DISTRIBUTION AND TRANSPORT),

GOAL: SUSTAINABLE DEVELOPMENT.

BALANCE BETWEEN ECONOMICAL NEEDS OF INDUSTRY AND ECOLOGICAL NEEDS OF THE PLANET

A SUSTAINABLE SUPPLY CHAIN IS : <u>TRANSPARENT, GREEN AND CIRCULAR</u>

SUSTAINABLE LOGISTICS - THE AREAS



SUSTAINABLE LOGISTICS - THE AREAS

- 1. DISTRIBUTION AND TRANSPORT:
 - DE-CARBONIZATION : ALTERNATIVE FUELS, ELECTRIC MOBILITY
 - INFRASTRUCTURES
 - URBAN LOGISTICS (LAST MILE)
 - INTER MODAL TRANSPORT
- 2. LOGISTICS DATA MANAGEMENT AND COLLECTION
 - ROUTE OPTIMIZATION
 - CLOUD COMPUTING
- 3. WAREHOUSING : ECO-FRIENDLY BUILDING DESIGNS, ENERGY-EFFICIENT MATERIALS,
- 4. PACKING : SUSTAINABLE PACKAGING
- 5. WASTE MANAGEMENT : RECYCLING, REVERSE LOGISTICS

SUSTAINABLE LOGISTICS - THE PARADOX

- DOES REDUCING EMISSIONS = RECUCED PROFITS?
- TENDENCY OF COMPANIES TO CONSIDER LOGISTICS PROCESSES AS MERE COSTS, AND SELECTING SUPPLIERS ON MERE PRICE,

BUT :

- THE INVESTMENT CAN GENERATE VALUE!
- THE NEGATIVE CONSEQUENCES OF A INEFFICIENT LOGISTICS ARE PAID BY THE WHOLE COMMUNITY

SUSTAINABLE LOGISTICS - THE BENEFITS

- RECYCLED MATERIALS AND RENEWABLE ENERGIES LOWER THE ENERGETIC COSTS
- BRAND IMAGE
- CUSTOMERS AFFINITY
- SYSTEMS EFFICIENCY
- WINNING BIDS WITH LOGISTIC TENDERS





PARIS - AGENDA 20-30 AND 17 SUSTAINABLE DEV. GOALS (SDGs) :

- ONE MAIN GOAL: 55% LESS EMISSIONS BY 2030 COMPARED TO 1990
- 17 SUSTAINABLE DEVELOPMENT GOALS (SDGs), IN TERMS OF : SECURITY, ACCESSIBILITY OF TRANSPORTS, REDUCTION OF POLLUTING EMISSIOI CONNETTIVITY ..
- FF55 : FIT FOR 55, LIST OF PROPOSALS BY EUROPEAN COMMISSION (EU GREEN DEAL, 2020)



EUROPEAN GREEN DEAL:

SUSTAINABLE AND SMART MOBILITY STRATEGY

BY 2030	BY 2050
- at least 30 million zero-emission	- nearly all cars, vans, buses as well
cars on European roads	as new heavy-duty vehicles will be
– 100 European cities climate	zero-emission.
neutral.	– fully operational, multimodal
 scheduled collective travel for 	Trans-European Transport Network
journeys < 500 km carbon neutral	(TEN-T) for
 automated mobility deployed at 	sustainable and smart transport
large scale	with high speed connectivity.

GOAL : 90% reduction in transport-related greenhouse gas emissions by 2050.



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IN ITALY :

- STRUCTURAL DEFICIT FOR TRANSPORT INFRASTRUCTURE
- DEPENDENCE FROM FOSSIL FUELS SUPPLY FROM OTHER COUNTRIES
- → NEED TO ACCELERATE ON DE-CARBONIZATION AND REACH ENERGY INDIPENDENCY !
- \rightarrow PIANO NAZIONALE PER L'ENERGIA E IL CLIMA (PNIEC)
 - SERIE OF MESURES TO REDUCE THE IMPACT OF POLLUANT FUELS, AND RENOVATE THE MOBILITY SYSTEM
- \rightarrow RE-POWER EU PROJECT (MAY 22, BC. OF WAR IN UKRAINE)

IN ITALY :

- PNRR (PIANO NAZIONALE DI RIPRESA E RESILIENZA)
 - STRATEGIC DOCUMENTS FROM THE ITALIAN GOVERNMENT
 - JUNE 2021
 - 62 MLD€ FOR MOBILITY, INFRASTRUCTURE AND LOGISTICS
 - MISSION #2 "GREEN REVOLUTION AND ECOLOGICAL TRANSITION" : SUSTAIBABLE MOBILITY, NEW HYDROGEN NETWORK
 - **MISSION #3** "INFRASTRUCTURE FOR A SUSTAINABLE MOBILITY" : TOWARDS A NEW INFRASTRUCTURE, DIGITALIZED AND SUSTAINABLE

1. DISTRIBUTION AND TRASPORT



TRANSPORT EMISSION AS A SHARE OF TOTAL EU-28 GHG EMISSIONS, AND ROAD TRANSPORT EMISSIONS AS A SHARE OF EU TRANSPORT GHG EMISSIONS (2019)

1. DISTRIBUTION AND TRASPORT

- IN ITALY IN 2019, TRANSPORT AND DISTRIBUTION REPRESENTED 24,6% OF TOTAL GHG EMISSIONS
- MAIN SOLUTIONS :
 - DE-CARBONIZATION
 - NEW INFRASTRUCTURES
 - URBAN LOGISTICS
 - INTER-MODAL TRANSPORT



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DE-CARBONIZATION OF VEHICLES IS ONE OF THE MAIN KEYS TO ACHIEVE THE 20-30 AGENDA.

- NEED TO RE-THINK PRODUCTION AND CONSUMATION, AND SWITCH TO RENEWABLES AND LOW-CARBON ENERGY SOURCES
- EMISSIONS MOSTLY COME FROM THE COMBUSTION OF PETOLEUM
- 4 PILARS :
 - SHIFT TO CLEAN ENERGY SOURCES
 - SHIFT TO <u>INNOVATIVE FUELS</u>
 - SHIFT TO ELECTRICITY
 - IMPROVE EFFICIENCY AND OPTIMIZATION OF <u>STORAGE</u>

SYNTHETIC FUELS : SAME PROPERTIES AS FOSSILS, BUT PRODUCED DIFFERENTLY (THROUGH RENEWABLE SOURCES)



 WORK WITH EXISTING TECHNOLOGIES
 POSSIBLE APPLICATION
 IN ROAD (LONG DISTANCE), AVIATION
 (SAF) AND MARITIME
 TRANSPORT



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HYDROGEN FUEL CELLS: USE THE CHEMNICAL ENERGY OR HYDROGEN OR OTHER FUELS TO CLEANLY AND EFFICIENTLY PRODUCE ELECTRICITY.

- WIDE RANGE OF POTENTIAL APPLICATIONS: INDUSTRY, TRANSPORT (RAILWAYS, AVIATION, MARITIME, HEAVY TRUCKS..)
 - HIGHER EFFICIENCIES (>60% THAN NORMAL FOSSIL COMBUSTION)
 - NO CARBON DIOXIDE EMISSION, NO AIR POLLUANTS, NO NOISE

HIGH COST FOR DEVELOPMENT NEED ADEQUATE PERFORMANCE TO BE MAINTAINED OVER LONG PERIODS NEED NETWORK OF RE-FOURNISHING STATIONS

ELECTRIC MOBILITY

- ACCORDING TO PNNR, THERE WILL BE +6 MLN OF ELECRTIC VEHICLES BY 2030 – ECONOMICAL INCENTIVES
- POSITIVE ENCOURAGING TREND : IN SEPT 2021, IN EUROPE MORE ELECTRIC CARS THAN DIESEL CARS WERE SOLD.
- MAIN IDEA : ELECTRICITY AS A FUEL
- APPLICATION: LIGHT COMMERCIAL VEHICLES (EX: DHL, AMAZON, UPS). HEAVY TRUCKS : MORE COMPLEX, NEED RE-CHARGING INFRASTRUCTURE

ELECTRIC MOBILITY

TECHNOLOGY	PROS	CONS	
FCEV OR ICEVS (HYDROGEN FUEL CELL ELECTRIC VEHICLES)	QUICK REFOURNISHMENT, HIGHER AUTONOMY OF BATTERIES, FLEXIBILITY	HIGH COST OF VEHICLES HIGH COST OF PRODUCTION	
BEV VEHICLES (BATTERY ELECTRIC VEHICLES)	HIGH ENERGETIC EFFICIENCY LOW COSTS COMPARED TO DIESEL OR HYDROGEN COMPATIBILITY WITH OTHER INFRASTRUCTURS	HIGH COST OF VEHICLES LONGER TIMES FOR RECHERGE LIMITED AUTONOMY OF BATTERIES	
PHEV AND HEV (HYBRID / PLUG IN HYBRID VEHICLES)	DO NOT NEED TO REMOVE THE EXISTING ENGINES SMALLER BATTERIES	HIGHER MAINTENANCE COST HIGHER EMISSIONS	

ELECTRICAL HIGHWAYS, FOR MAXIMISING TRUCKS AUTONOMY

- CATENARY SYSTEM (OVERHEAD POWER LINES)
- WIRELESS INDUCTION (COILS UNDER ASPHALT)
- ELECTRIC RAILS
- ONLY ON SMALL PORTION OF ROUTES
 - NO NEED OF HEAVY BATTERIES
 - NO NEED FOR REFUELLING OR RECHARGHING STOPS
 - LOW MAINTENANCE FOR THE INFRASTRUCTURE,
 - HIGH INVESTMENT

WHERE : SWEDEN (FIRST IN 2016), GERMANY, LOS ANGELES.



FIRST E-HIGHWAY ON A 10 KM PUBLIC ROUTE NEAR ESSEN. DESIGNED BY SIEMENS

COLD IRONING : PROVIDING SHORESIDE ELECTRICAL POWER TO SHIPS AT BERTH WHILE ENGINES ARE OFF.

- REDUCTION OF CO2 EMISSIONS. IMPROVE THE AIR QUALITY,
 - REDUCE NOISE POLLUTION, REDUCES LIFECYCLE COSTS
 - IMPORTANT INVESTMENTS : EXTRA ELECTRICAL CAPACITY NEEDED IN PORTS, "PLUG"SYSTEMS
 - LACK OFSTANDARDIZATION BETWEEN SHIPS
 - EXPENSIVE TECHNOLOGY
 - WHERE: PORT OF LOS ANGELES (2004), SEATTLE, ANTWERP



1. DISTRIBUTION AND TRASPORT - INTERMODAL



- INTERMODAL TRANSPORT : STANDARDIZED CARGO UNITS (CONTAINERS, SWAP BODIES AND SEMI-TRAILERS) EASILY MOVED ACROSS DIFFERENT MODES OF TRANSPORTATION
- COMBINED TRANSPORT : MOST OF ITS LENGHT MUST BE COVERED BY RAIL, BARGE OR SEA (AVOID TRUCK HAULAGE)
- AVOID BREAKING CARGO (-> DIFFERENCE WITH MULTIMODAL)

1. DISTRIBUTION AND TRASPORT - INTERMODAL



- EFFICIENCY
 - EFFECTIVENESS
 - ECONOMY OF SCALE
 - SUSTAINABILITY
 - NOT THE BEST SOLUTION
 FOR SHORT DISTANES
 - TRANSIT TIME AND SPEED
 - CAPILLARITY OF SERVICE

1. DISTRIBUTION AND TRASPORT – URBAN MOBILITY

- CITIES ARE MORE EXPOSED TO AIR POLLUTION, NOISE, TRAFFIC..
- PRIME SOURCE OF GREENHOUSE GAS EMISSIONS (MOSTLY FROM TRANSPORT)
- F/L/O OPTIONS : FIRST, LAST, ONLY MILE MOBILITY OPTIONS, TO COMPLETE <u>EFFICIENT</u> TRANSPORTS
- ALLOW PEOPLE AND GOODS TO TRAVEL BETWEEN THE STARTING POINT AND THE START HUB, OR BETWEEN THE END HUB AND THE DESTINATION
 - REDUCE TRAFFIC NOISE, AIR POLLUTION, CONGESTIONS
 - SUSTAINABLE URBAN TRANSPORT IS NOT ALWAYS THE BEST OPTION FOR SENDERS AND RECIPIENTS OF THE GOODS : EXTRA TIME, COST

1. DISTRIBUTION AND TRASPORT – URBAN MOBILITY

• UCC : URBAN CONSOLIDATION CENTRES

- THEY BUNDLE GOODS FOR MORE EFFICIENT DISTRIBUTION
- MICRO-HUBS : PARCEL LOCKERS, PROXIMITY DELIVERY POINTS.
- THE PERFECT SOLUTION : COMBINATION OF HIGH CONCENTRATION OF DELIVERY POINTS AND MANY SMALL DELIVERIES BY DIFF. CARRIERS
- THE NUMBER IN EUROPE IS STILL VERY LOW, BUT :
- SOLUTIONS : PROVIDE ADDED VALUE TO THE CLIENTS (F.I, RETURN LOGISTICS, DELIVERY ADAPTING, ATTRACTIVE FEES FOR SENDERS..) AND CHANGE THE REGULATORY FRAMEWORK BY INTERNALIZING EXTERNAL COSTS

1. DISTRIBUTION AND TRASPORT – URBAN MOBILITY



1. DISTRIBUTION AND TRASPORT

SECTOR	ROAD (LIGHT)	ROAD (HEAVY TRUCKS)	NAVAL	AVIATION	RAILWAYS
MAIN SOLUTIONS	- BEV (DIRECT ELECTRIFICATION) - PHEV, HEV (HYBRIDS) - LAST MILE	 ELECTRIC ROAD SYSTEMS FCEV (HYDGOREN) HUB AND SPOKE SYNTHETIC FUELS 	- GNL - SYNTHETIC FUELS - COLD IRONING - HYDROGEN (STILL AT THE BEGINNING)	- SYNTHETIC FUELS - HYDROGEN	- DIRECT ELECTRIFICATION (E-HIGHWAY) - HYDROGEN

- DIGITALIZATION IS ESSENTIAL FOR SUSTAINABLE LOGISTICS
- TOOLS : BIG DATA , AI , IOT , CLOUD , BLOCKCHAIN..
- SYNERGY AND SYNCHRONIZATION ARE PILLARS OF EFFECTIVE MANAGEMENT AND PLANNING
- VIBILITY, OPTIMIZATION,

VALUABLE INSIGHTS, IMPROVED HORIZONTAL AND VERTICAL COLLABORATION.. INNOVATION IS VITAL!



DIGITISATION OF INFORMATION

- DIGITISING ANALOGUE DOCUMENTATION, FOR AUTOMATISING SOME MANUAL PROCESSES AND STREAMLINE THEM..
- SUPPLY CHAIN MANAGEMENT SYSTEMS
- MANAGEMENT SYSTEMS, CRM, ETC.
- GOING "PAPERLESS"



BIG DATA AND AI

- ANALYSIS AND EVALUATION OF THE COLLECTED DATAS DURING THE TRANSPORTS, FOR PROVIDING CORRECT INFORMATIONS AT ALL TIME
- SHARING SHIPPING DETAILS WITH GPS
- MAIN USE : FLEET MANAGEMENT AND RISK MANAGEMENT
- ATTENTION TO THE USE : RISK OF DRAWING THE WRONG CONCLUSIONS, AND LACK OF DATA PROTECTION!
- A BIG DATA STRATEGY SHOULD ALWAYS BE STRUCTURED AND COMPAY-RELATED, AND OPEN TO INNOVATION

<u>ROUTE OPTIMIZATION</u>

- ALGORITHMS FOR ANALIZING THE ENVIRONMENT AND GENERATING EFFICIENT ROUTES , AND ADJUSTING DELIVERY PRIORIZATION.
- DEEP LEARNING : WORKS IN REAL TIME AND ADAPT TO FLUCUATION OF TRAFFIC, ETC..
- CALCULATION THAT ELIMINATES THE HUMAN FACTOR AND BRINGS MORE ACCURANCY



• <u>AUTONOMOUS VEHICLES</u>

- RELY ON ROUTE PLANNING AND AI . EXEMPLE : ELECTRIC SELF-DRIVING BOATS –
- EX : YARA, NORWAY, THE AUTONOMOUS 0 EMISSION FEEDER





CLOUD COMPUTING

- IT'S ALL ABOUT INTEGRATING AUTOMATION INTO THE SUPPLY CHAIN.
- CLOUS SOFTWARES, PLATEFORM THAT GATHERS ENVIRONMENTAL DATAS ON HEAVY TRUCKS EMISSIONS AND GUIDES THE DRIVERS THROUGH MOST ECOLOGICAL PATHS → AVOID DELAYS
- PROTECTION OF THE DATAS, STORAGE AND COST REDUCTION

• INTERNET OF THINGS

- TOOLS FOR PLANNING, MONITORING, HEIGHTENING THE SECURITY OF ALL OPERATIONS.
- FUEL EFFICIENCY, WASTE REDUCTION, INFRASTRUCTURE MANAGEMENT
- EXEMPLE :
 - PIRELLI USES SENSORS FOR WAREHOUSING AND MANUFACTURING THAT REDUCE TOXIC EMISSIONS.
 - AMAZON IMPLEMENTED INVENTORY TRACKING SYSTEMS

3. WAREHOUSING



- ECO-FRIENDLY BUILDINGS : AUTOMATION, LEAN WAREHOUSING AND GREEN BUILDINGS
- THE METHODS TO REDUCE ENRIVONMENTAL IMPACT :
 - LOW OF DEMAND FOR ELECTRICITY , FOR : HEATING, COOLING, LIGHTING
 - WASTE REDUCTION
 - EFFICIENT BUILDINGS

3. WAREHOUSING

• THE TOOLS:

- WAREHOUSE MANAGEMENT SYSTEM (WMS)
- ORDER-PICKING TECHNOLOGY
- BAR CODING
- RADIO FREQUENCY IDENTIFICATION

CHALLENGES :

- LESS SOLUTIONS FOR GREEN WAREHOUSING THAN TRANSPORTATION
- INITIAL INVESTMENTS

3. WAREHOUSING

LEADERS AND GOOD EXEMPLES:

- RECREATIONAL EQUIPMENT INC DESIGNED A NET-ZRO DISTRIBUTION CENTER IN ARIZONA
- PATAGONIA : SUSTAINABLE CONCEPTS AND MATERIALS FOR ENERGY EFFICIENCY
- WAREHOUSE AUTOMATION

- REVERSE LOGISTICS : MOVING GOODS FROM CUSTOMERS BACK TO THE MANUFACTURERS.
- GOAL : REGAIN VALUE FROM THE PRODUCTS
- RESPONSIVE SUPPLY CHAIN CAN HANDLE THIS PROCESS AND MANAGE WASTES
- COMPANIES ARE CHANGING THE WAY TO ADDRESS WASTE!



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• THE STEPS OF REVERSE LOGISTICS:



BENEFITS:

- CIRCULAR ECONOMY, NEW SUSTAINABLE PRACTICES;
- COST REDUCTION
- CUSTOMER SATISFACTION AND BRAND IMAGE
- LOSS REDUCTION
- WASTE REDUCTION
- CHALLENGES :
- THE RIGHT INFRASTRUCTURE MUST BE SET UP (SOFTWARES AND WAREHOUSING)
- INBOUND AND OUTBOUND LOGISTICS MUST BE TRACKED

- EXAMPLES : REVERAGE INDUSTRY (EMPTY CANS), CONSTRUCTION INDUSTRY (RAW MATERIALS), FOOD INDUSTRY (PACKAGING MATERIALS).
- LEVI'S : REPROCESSING AND RECOVERING OF RETURNED/USED JEANS
- PROCTER&GAMBLE, PEPSICO, UNILEVER SHIFT REUSABLE PACKAGINGS THAT CAN BE RETURNED.
- GE HEALTHCARE, CISCO REPAIR AND REMANUFACTURES DEFECTIVE OR OUT-OF-DATE GOODS

- A LOT OF PACKAGINGS ARE SENT EVERYDAY IN THE WORLD.
- AMAZON SHIPS 13MLN PRIME PACKAGES PER DAY
- PACKAGING CONTRIBUTES TO 77,9 TONS OF MUNICIPAL SOLID WASTE PER YEAR (30% OF THE TOTAL WASTE!)
- PACKAGING IS A HIGH COST OF GOODS :
 - OUT OF EVERY 10USD SPENT ON COMMODITIES, 1USD GOES FOR PACKAGING.
 - 30USD PER TON SPENT ON RECYCLE TRASH, 50USD TO TRANSPORT TO THE LANDFILL AND 70USD TO INCENERATE IT.
- WE NEED TO INVEST IN GREEN PACKAGING!!!

• GREEN (OR SUSTAINABLE) PACKAGING : USES MATERIALS AND MANUFACTURING TECHNIQUES TO DIMINISH ENERGY USE AND HARMFUL IMPACTS ON ENVIRONMENT.

GREEN PACKAGING SOLUTIONS :

- PACKAGING INCLUDING RENEWABLE SOURCES
- PACKAGING WITH ADDITIVES
- RECYCLABLE MATERIALS
- COMPOSTABLE MATERIALS
- PACKAGING REDUCTION

BENEFITS OF GREEN PACKAGING :

- DIMISHED RELIANCE ON FOSSIL FUELS
- REDUCED USE OF NATURAL RESOURCES
- INCREASED USE OF RECYCLED PRODUCTS
- MORE ENERGY-EFFICIENT MANUFACTURING METHODS
- INCREASED USE OF RENEWABLE RESOURCES
- CLEANER AND SAFER OCEANS



Materials Used in Green Packaging

Starch-Based Biomaterial Other Plant-Based Biomaterials Biodegradable Packing Peanuts Corrugated Bubble Wrap Mushroom-Based Packaging Recycled Cardboard and Paper Post-Consumer Recycled Plastics Organic Fabrics Refurbished Products







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CASE STUDIES



COLD IRONING : PLANT FOR SHIPS ONSHORE POWER SUPPLY

- ENVIRONMENTALLY EFFECTIVE MESURE FOR REDUCING POLLUTION **AROUND PORTS.**
- A CRUISE SHIP AT BERTH PRODUCE IN 10 HOURS = CO2 OF 25 MID SIZE CARS, AND REQUIRE ENERGY = 80.000 INHABITANTS CITY
- IN 2010 : GROUP OF DESIGNERS OF THE GENOVA PORT AUTHORITY FINALIZED THE DESIGN, AND THE CONTRACT WAS AWARDED BY COMPANY SATREL.
- IN 2011 IGM ENGINEERING (TODAY DBA PROGETTI) STARTED THE WORK, AND IN 2018 THE COLD IRONING PLANT ENTERED INTO **OPERATIONS**



Fig.1 Infrastruttura di terra per l'alimentazione delle navi / Ground infrastructure for ships power supply

- COMPLEXITY OF ONSHORE POWER SUPPLYING : IN EUROPEAN PORTS, THE GENERAL DELIVER OF ELECTRICITY POWER SUPPLY IS 50 HZ – WHEREAS MOST SHIPS NEED 60HZ
- →NECESSARY ADAPTATION:
- 2-FOLD MEDIUM VOLTAGE DISTRIBUTION NETWORK WAS REALIZED, FOR MORE FLEXIBILITY (SUPPLIED BY ENEL)
- AN UNDERGROUND ELECTRICAL CORD CONNECS THE MAIN SUBSTATIONS



Fig. 2 Bacini Carenaggio Porto di Genova/ Bacini Carenaggio Port of Genoa*



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A NEW CLASS OF LIQUEFIED NATURAL GAS-POWERED VESSELS

- CMA CGM IS A FRENCH CONTAINER TRANSPORTATION AND SHIPPING COMPANY – 3° LARGEST IN THE WORLD, 257 SHIPPING ROUTES, 420 PORTS IN 160 COUNTRIES.
- THE NAME : COMPAGNIE MARITIME D'AFFRETEMENT (CMA) AND COMPAGNIE GENERALE MARITIME (CGM)
- IN 2017 : RODOLPHE SAADE' (CEO) ANNOUNCED THE DECISION TO ORDER 9 SHIPS OF 23,000 TEU WITH AN LNG POWER SUPPLY.
- RESULT OF 7 YEARS OF R&D

IN 2022 :
26 CONTAINERSHIPS OF
VARIOUS SIZES,
OPERATING WITH LNG.

• ROUTES : ASIA-EUROPE, USA-EUROPE.



- MAIN REFERENCE PORTS : MARSEILLE AND ROTTERDAM.
- ROTTERDAM PORT IS BECOMING A WORLD-CLASS HUB FOR LNG

- LNG IS A SOLUTION THAT ALLOWS REDUCTION OF 99% IN SULFUR DIOXIDE AND FINE PARTICLE DIOXIDE. IT EMITS UP TO 20% LESS CO2 THAN FUEL-POWERED SYSTEMS
- GNL TECHNOLOGY ALLOW THE USE OF ORGANICALLY-PRODUCES BIOMETHANE MADE FROM AGRICULTURAL AND DOMESTIC WASTE :

CMA CGM SADE IS ONE OF THE FIRST SHIPS THAT WAS FUELED WITH BIOMETHANE, AND SIGNIFICANTLY REDUCED THE CARBON FOOTPRINT OF THE LNG USED IN THIS OPERATION.

• LNG IS A DECISIDE STEP FORWARD CMA CGM'S TARGET OF BEING CARBON-NEUTRAL BY 2050



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- BOMI GROUP IS A LOGISTICS GROUP BASED IN TORINO, THAT OFFERS RELIABLE AND COST-EFFECTIVE SOLUTIONS FOR THE HEALTHCARE INDUSTRY.
- CURRENTLY PRESENT IN ITALY, ARGENTINA, BELGIUM, BRAZIL..
- 3000 EMPLOYEES.
- IN 2017 : START OF THE PROCESS THAT LEAD TO AN EVALUATION OF THEIR MATURITY AND COMMITMENT
- IN 2018 : SUSTAINABLE LOGISTICS CERTIFICATION (FIRST LOGISTIC INDUSTRY IN ITALY)



INNOVATIVE AND SUSTAINABLE WAREHOUSE

- WAREHOUSE OF SPINO D'ADDA, IN THE REGION OF CREMONA : 34,000 SQM OF LAND, IN WHICH A NEW SUSTAINABLE WAREHOUSE HAS BEEN BUILT
- LOGISTIC PLATEFORM OF 18,500 SQM FOR WAREHOUSING AND TRANSPORTATION HUB, FULLY ENERGETICALLY INDIPENDENT:
 - THERMICAL ISOLATION
 - SOLAR PANNELS ON THE ROOF
 - GEO-THERMICAL IMPLANT ALIMENTED BY GROUND WATER, TO PREODUCE CLEAN ENERGY
- AND FULLY AUTOMISED : INVESTMENTS IN AUTOMATION AND ROBOTICS

INNOVATIVE AND SUSTAINABLE WAREHOUSE





 $V_{B} = \mu_{S} \cdot B_{2} + \frac{a}{m} S \cdot B = \frac{a}$ * vy vy "N(ap) 0 12 110 -17-2 wints Viecadary (Z179) K= (Z.1)/Z1e 1000 12700° 140012 Al 10-1m-2= 3.2 × 10-7 $\frac{\sqrt{2}}{r} \quad \mathcal{V} = \frac{(16 \times 10^{-7} c)(4 \times 10^{9} N \cdot m^{2}/6^{2})}{(4 \times 10^{10} N \cdot m^{2}/6^{2})^{N} (5 \times 10^{10} M \cdot m^{2}/6^{2})^{N}} \frac{110}{204 \mu_{3}^{2} \sigma_{20}^{2}} \frac{110}{204 \mu_{3}^{2} \sigma_{20$ צ"עויט -Shit + my - HSSE/mS = 240 S/t -240 " Ying Sie Vita $\begin{aligned} & \mathcal{V}_{m,k}\left(r,\theta,\phi\right) = \mathcal{R}_{n,k}\left(r\right) \mathcal{V}_{k,m}\left(\theta,\phi\right) & f_{m,T}\left(S,\theta \times 10^{\frac{26}{3}} \frac{a t m^{10}}{10^{10}} \left(r^{-6} m\right) \\ & \mathcal{E}_{n,k} = \frac{2}{2} \left(\frac{e^{-2}}{97(16/6)} \right)^{\frac{1}{m^{10}}} = -\frac{E_{n,k}}{2} & \left[\frac{(r+1)^{2} M_{k+1,m}}{(r)(2r+2)^{10} V^{10}(6\pi0)^{-1}} \cdots \frac{m^{10}(n^{10})^{10}}{(r)(2r+2)^{10} V^{10}(6\pi0)^{-1}} \right] \\ & + & N(n)_{k} \cdot \frac{M_{k}(n)}{2} = \frac{M_{k}(n^{10})^{10}}{2} \left(\frac{m^{10}}{2} \frac{m^{10}}{2} \frac{m^{10}}{2}$ $-m_{y}v_{y} \cdot m_{y}V_{z} = \int_{-\infty}^{\infty} f(y_{y}) dy_{x} = C' \left(\frac{2\pi}{\beta m}\right)^{b_{y}} = I \quad \text{Werrell velocity}$ $\begin{array}{c} \left[\begin{array}{c} \frac{\left(2 + V 2 V l + t \sigma \right)^{n}}{\left(2 + V 2 V l + \sigma \right)^{n}} & \frac{1}{\left(2 + V 2 V l + \sigma \right)^{n}} & \frac{1}{\left(2 + V 2 + \sigma \right)^{n}} & \frac{1}{\left(2$ $\frac{\left[\frac{\mathcal{B}(\mathcal{N},\mathbf{1},d\mathcal{V}_{d})}{2\pi}\right] \mathcal{C}_{\mathbf{T}}^{*}\left(\frac{\mathcal{B}(\mathcal{M})}{2\pi}\right)^{k_{n}} \mathcal{C}_{\mathbf{T}}^{*}\left(\frac{\mathcal{B}($ $\begin{array}{c} \mathcal{U} \rightarrow ron\theta \\ \mathcal{U} \rightarrow r$ $\begin{array}{c} & & \\ & &$ $\frac{1}{2} \begin{pmatrix} 1 & 1 \\ 0 & 0 \\ 0$ admemegenerator.net

CONCLUSIONS

- A GLOBAL PUSH TOWARDS RE-THINKING THE WHOLE LOGISTICS NETWROK AND METHOD IS RISING, ESPECIALLY AFTER THE YEARS OF SUPPLY CHAIN CRISIS .
- IN 2021 GLOBAL FREIGHT HAS RE-STARTED, WITH HIGHER LEVELS OF GHG EMISSIONS AND HIGHER COSTS (AND PROFITS), BUT SOMETHING IS CHANGIN.
- NEW SUSTAINABLE SOLUTIONS ALREADY EXISTS : SYNTHETIC FUELS, HYDROGEN, ELECTRICAL MOBILITY, AS WELL AS LAST MILE OPTIONS, INFRASTRUCTURES, INNOVATION IN METHODS, ETC.
- THEY ALL HAVE THEIR LIMITATIONS, BUT WILL PROBABLY BE MORE AND MORE EFFICIENT
- KEYS TO SUSTAINABLE LOGISTICS :
 - CREATE THE BASES AND <u>CULTURAL MINDET IN THE INDUSTRY</u>. ANALYZE THE ADVANTAGES, THE POTENTIAL
 - GENERATE A FIRST ANALYSIS OF SUSTAINABILITY, FOR ALL THE STAKEHOLDERS.
 - TRANSLATE INTO ACTION
- EVEN THOUGH WE CANNOT EXPECT DIRECT ROI FROM THIS PATH, WE CAN START AND ADAPT

CONCLUSIONS

• THOUGHTS? QUESTIONS?

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Presentation is over

Thank you for your attention!