VISIR and sustainable maritime transportation

Gianandrea Mannarini | CMCC

GUTTA opening conference | Lecce | 06 March 2019

Outline

1) Climate Change (CC) mitigation: reasons for concern

2) VISIR ship routing model

Outline

1) Climate Change (CC) mitigation: reasons for concern

2) VISIR ship routing model

IPCC report on 1.5 deg warming (Oct.2018)

Arctic sea-ice melting

Coral reef bleaching

Flooding

heat waves

https://www.ipcc.ch/sr15

Interreg Italy - Croatia GUTTA
European Regional Development Fund
EUROPEAN UNION
cmcc
MARE NOSTRUM
Sveučilište u Zadru
Universitas Studiorum Jadertina 1396 2002
Republika Hrvatska
Ministarstvo Mora, Prometa i Infrastrukture
Autorità di Sistema Portuale del Mare Adriatico Meridionale
Bari, Brindisi, Manfredonia, Barletta, Monopoli

Cumulative GHG emissions determine Global Warming

Every extra bit of warming matters, especially since warming of 1.5 °C or higher increases the risk associated with long-lasting or irreversible changes, such as the loss of the Greenland ice sheet or warm water coral reefs.

Hans-Otto Pörtner
Co-Chair, WG II
Incheon, 8 October 2018

ipcc INTERGOVERNMENTAL PANEL ON climate change

Interreg Italy - Croatia GUTTA
European Regional Development Fund
EUROPEAN UNION
cmcc
MARE NOSTRUM
Sveučilište u Zadru 1396 2002 Universitas Studiorum Jadertina
Republika Hrvatska
Ministarstvo Mora, Prometa i Infrastrukture
Autorità di Sistema Portuale del Mare Adriatico Meridionale
Bari, Brindisi, Manfredonia, Barletta, Monopoli

Verificating where we are with CC mitigation efforts

EU GHG trends (aviation in; land-use change not in)

2020: on-track

2030: not on-track

2050: not on-track

Figure 2.1 **Greenhouse gas emission trends, projections and targets in the EU, 1990-2050**

Notes: The GHG emission trends, projections and target calculations include emissions from international aviation, and exclude emissions and removals from the LULUCF sector. The WEM scenario reflects existing policies and measures, whereas the WAM scenario considers the additional effects of planned measures reported by Member States.

Sources: EEA, 2018h, 2018b, 2018c, 2018f.

European Environment Agency

«Trends and projections in Europe 2018», EEA Report No 16/2018

Interreg Italy - Croatia GUTTA
European Regional Development Fund

EUROPEAN UNION

EU **transport** GHG trends (aviation included)

2030: not on-track

2050: not on-track

2050 maritime: ?

European Environment Agency

«Greenhouse gas emissions from transport», EEA 2018

Notes: 2030 transport target: 8 % increase in greenhouse gas emissions from transport compared with 1990 levels.
2050 transport target: 60 % reduction in greenhouse gas emissions from transport compared with 1990 levels.
2050 maritime target: 40 % reduction in greenhouse gas emissions from maritime transport compared with 2005 levels.
Overall greenhouse gas emissions from transport (including aviation but excluding international shipping) are represented by an orange line. Emissions from international maritime transport are shown in blue.
*2017 proxy data.

IMO **initial strategy for** GHG emission reduction (April 13, 2018)

1. EEDI revision for new ships
2. Reduce carbon intensity by at least 40% by 2030
3. Emissions to be reduced at least by 50% by 2050 compared to 2008

MEPC.304(72)

INTERNATIONAL MARITIME ORGANIZATION

SUSTAINABLE DEVELOPMENT GOALS

7 AFFORDABLE AND CLEAN ENERGY

7.3 By 2030, double the global rate of improvement in energy efficiency

13 CLIMATE ACTION

13.2 Integrate climate change measures into national policies, strategies and planning

An old-fashioned virtue: pertenacity

« Gutta cavat lapidem,
consumitur anulus usu »

(Ovid, *Epistulae ex Ponto*, liber IV, 10, 5.)

«A drop hollows out a stone,
a ring is worn by use»

Outline

1) Climate Change (CC) mitigation: reasons for concern

2) VISIR ship routing model

VISIR ship routing model (2012-2019) in a slide

Safety constraints:

→I.M.O. MSC.1/Circ.1228 (+2nd generation) for:

- Parametric roll
- Pure loss of stability
- Surfriding/ broaching-to

Objective:

least-time routes

Environmental fields:

currents

waves

EEOI savings assessment

Other features:

Intentional speed reduction

Validation:

1- Analytical solutions

2 – Other model

3 - AIS tracks

MarineTraffic

VISIR routes in the Atlantic Ocean

Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2018-292
Manuscript under review for journal Geosci. Model Dev.
Discussion started: 14 February 2019
© Author(s) 2019. CC BY 4.0 License.

(Mannarini & Carelli, 2019)

Geoscientific Model Development Discussions
Open Access
EGU

Calm ocean:

the optimal track diverts South for exploiting advection by the Gulf Stream

Wave-only

Wave and currents

3,344 nmi	161 h: 43 m
3,384 nmi	156 h: 45 m

Interreg Italy - Croatia GUTTA
European Regional Development Fund
EUROPEAN UNION

VISIR routes in the Atlantic Ocean

Rough ocean:

the optimal track diverts North for avoiding speed loss in waves

Wave-only

Wave and currents

3,344 nmi	182 h: 25 m
3,385 nmi	177 h: 06 m

Interreg Italy - Croatia GUTTA
European Regional Development Fund
EUROPEAN UNION

VISIR routes in the Atlantic Ocean

VISIR routes in the Atlantic Ocean

Track bundle shrinking and shifting South to exploit advection by the Gulf Stream

VISIR: EEOI savings

strong seasonal and intra-monthly variability

VISIR: ocean wide statistics of EEOI savings

Main reasons for EEOI savings:

- Northern Atlantic: **waves** & **currents**
- Equator: **currents**
- Southern Atlantic: **waves**

VISIR: open and free discovery-application

www.atlantos-visir.com

Explore individual track EEOI saving

Interreg Italy - Croatia GUTTA
European Regional Development Fund
EUROPEAN UNION

VISIR: user uptake

Karine,
New York,
May 5, 2017

Arturo,
Napoli,
Mar.1, 2018

Florian,
Delft,
May 28, 2018

Gianandrea,
London
Oct.22, 2018

Interreg Italy - Croatia GUTTA
European Regional Development Fund
EUROPEAN UNION

VISIR open-source model code

https://zenodo.org/record/2563074#.XHOwgJNKg6d

zenodo | Search | Upload | Communities

February 12, 2019

Software | Open Access

VISIR-1.b ship routing model

Mannarini, Gianandrea; Carelli, Lorenzo

LGPL Free Software
Free as in Freedom

Gianandrea Mannarini
Scientist at CMCC
1s

Out of love for transparency and reproducibility, we have just published the latest VISIR manuscript, with a thorough description of its governing equations, validation, performance, extensive case studies, videos, and -last but not the least- a full release on Zenodo of the model source code (LGPL license) , including user manual and install script, input and output data.

Everything -like genuine love- for free and forever, on Geoscientific Model Development Discussions, https://lnkd.in/dJk-7XB, where the manuscript starts today its open peer-reviewing process.

Consigliato 6 volte

Chi lo consiglia?

536 visualizzazioni del tuo post nel feed

Interreg Italy - Croatia GUTTA
European Regional Development Fund
EUROPEAN UNION

Take home messages

1) Climate Change: it is late, seriously!

2) VISIR might help for ship emission reduction