

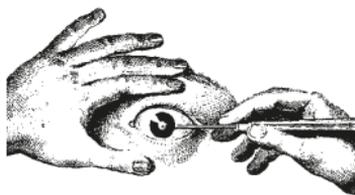


• EYE • ON • VENICE •

QUANTIFYING CRUISING

Giuseppe Tattara

CORTE DEL FONTEGO EDITORE

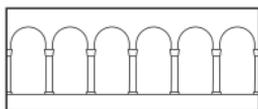


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Quantifying cruising

Study on the economic impact of large
cruise ships at Venice



CORTE • DEL • FONTEGO

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Quantifying cruising

*to my grandchildren Marèn,
Elijah and Emil who are far away*

A lively argument ruffles the waters of the Venice Lagoon. Does the arrival of ever larger cruise ships in increasing numbers represent an economic burden or a benefit for the city? Whether a ship brings profit or loss to the city depends on the money spent by the passengers, by the crews and the shipping companies, but also on the external diseconomies connected with cruise ship traffic – the atmospheric pollution caused by their engines, the water pollution, the risk of accidents, the need to provide appropriate structures for transit and mooring of these ocean giants. While the huge ships discharge their passengers in a city already saturated with tourists and undoubtedly post revenues, they also engender social and environmental costs. In this paper, for the first time, we study the economic impact of cruise ships on Venice, a balance between costs and benefits with reference to an assessment of the wellbeing of the city.

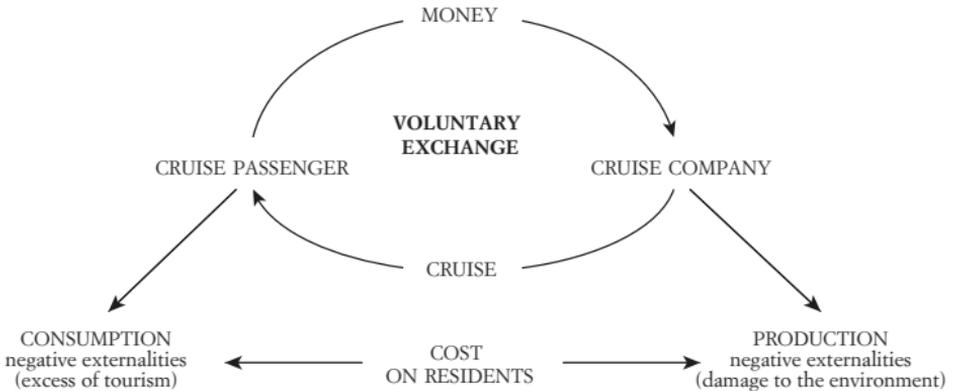
1. All that glisters is not gold

Ever since Adam Smith, economics has assumed that exchanges voluntarily performed in the market are of mutual advantage for the parties involved – for the simple reason that buyers or sellers would not enter upon such exchanges if they expected to be damaged. In general, however, a transaction also has effects on third parties and these effects may be negative. For example, a tourist pays a shipping company for a cruise and, in order to visit Venice, takes a *vaporetto* (ferry) to travel the Grand Canal and admire its beauty. But these transactions, freely performed by the tourist for purposes of pleasure, take on a different aspect when considered from other points of view.

The city's residents suffer a negative experience of the pollution produced by the ship and the *vaporetto*; of the damage effected by the wave-motion and by the crowding of the city and its public transport – however much they may benefit from the fact that their city is equipped with an efficient cruise terminal from which to embark on a subsequent voyage, a large airport and numerous museums.

These examples show how the externalities mark a break between the result of the exchange as viewed by the private agent, evaluated by the price, and the result observed from a social point of view or, as we say, “wellbeing”. The evaluation of the exchange at market

prices, in presence of externalities, does not provide an acceptable measurement of wellbeing. In other words, the exchange, representing an optimal transaction – because desired – for the individual, does not represent an “optimum” from the social standpoint.



Those who reap the profits deriving from cruise activity – the companies, the port authority – leave out of account the external costs: the unit cost for the companies is lower than the unit cost they would have to sustain if they bore the burden of the external costs; whereas the residents in the city centre have no choice but to sustain these external costs. When this occurs, the shipping companies have a strong incentive to act as free riders: that is they behave as agents drawing benefit from resources or services that they exploit without paying the

relative price for them. This leads to an excess of production (excessive offer of cruises) resulting in a deleterious effect on the life of the city.

The presence of external costs may pose the problem of intervention to improve social wellbeing: for example, an attempt to regulate the influx of tourists, and to require those responsible for pollution to repair the damage or to take steps to confront the environmental costs. But measures in this direction are seldom performed, and in order to achieve any result strong pressure is needed from public opinion aware of the damage undergone by residents and environment in the pursuit of advantages to the relatively few people involved.

2. Tourism exceeding what the city can support

The prime negative externality is tourism, which includes cruises. The rapid increase in cruise tourists in these last years has contributed to augmenting the numbers of these visiting Venice, with an influx far beyond the quantities the city can support without imploding. The “tourist carrying capacity” indicates the maximum number of persons who can visit the city without affecting its environmental, physical, economic and socio-cultural characteristics and without reducing the level of satisfaction that the tourists themselves may attain from their stay. This “carrying capacity” was quantified in 1988 by Costa

and van der Borg at 20,750 persons per day, equivalent to 7.5 million per year as optimal value and 12 million as deadline¹.

The tourists visiting Venice in 2011, however, were estimated by some researchers at 30 million², and Costa himself reckons 24 million³. A precise estimate is difficult because many of these are day-tourists who escape any survey, but in any case the threshold of 20 million is amply exceeded. The tourist offer has done its best to meet the demand and, in a liberalized urban perspective, the amounts of available hotels, B&B, restaurants and taxis have increased, but still without being able to satisfy the very rapid growth in demand. In addition, the increased offer has been targeted in part on general resources formerly available for residence, in this way manifestly penalizing the latter⁴.

¹ P. COSTA, J. VAN DER BORG, *Un modello lineare per la programmazione del turismo. Sulla capacità massima di accoglienza turistica del Centro Storico*, «COSES informazioni», 32-33 (1988), pp. 21-26 and P. COSTA, J. VAN DER BORG, G. GOTTI, *Tourism in European heritage cities*, «Annals of Tourism Research», 2 (1996), pp. 306-21.

² P. LANAPOPPI, *Dear Tourist*, in this series, 2014, pp. 18-21.

³ P. COSTA, *Crociere a Venezia tra opportunità e sicurezze*, «Porto di Venezia. Newsletter», 8 Dec. 2012.

⁴ The tourist demand competes with the residential one, e.g. in the housing market. L. FERSUOCH, *Venezia e Laguna al crepuscolo*, 17 Mar. 2013, in www.italianostra-venezia.org. By the same author, *Misreading the Lagoon*, in this series, 2014.

Yet the “carrying capacity” of the city itself has not grown. As we mentioned, this is a much broader concept than the “receptive capacity”, and envisions the city as a set of relations among subjects, the “urban attractiveness” gauged by the liveliness of places, the quality of life, the affection of the citizens, the social cohesion of the population – all conditions that act upon the attractiveness exerted by the city towards its population and the more discerning tourists. While doubts about the uncontrolled growth in the quantity of tourists have been aired by various international organizations, they have been disregarded by the local administration⁵.

To be sure, not all the tourists swarming into Venice arrive by cruise ship. Cruise tourists are like any others, and if tourist flows need to be regulated they must be so considered, whatever means of transport they employ.

Nonetheless, cruise tourism, however numerically limited, is especially worrying because its crowds visit the city in massive, concentrated waves, and because the means of transport used – the large ship – causes serious damage to the environment. From April till October these huge vessels moor and sail mainly at the weekends, a time when the city is swamped by the tourist influx to the point of collapse. In this situation, the extra

⁵ LANAPOPPI, *Dear Tourist*, pp. 7-10.

20-30,000 presences of cruise tourists over the summer weekends impose a severe burden on the life of the city.

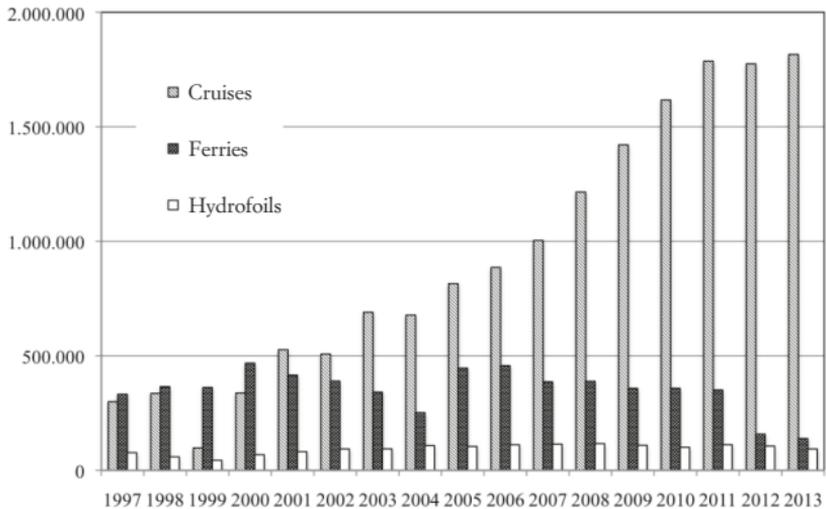
3. How many cruise tourists and how much do they spend?

3.1. Cruise traffic

The port of Venice lies within the Lagoon and since the 1970s has had two distinct accesses to the sea. One is across the Malamocco mouth and involves traffic destined for the commercial harbour of Marghera. The other is across the mouth of the Lido, used by passenger traffic to and from the Stazione Marittima (cruise terminal): this latter requires ships to traverse the San Marco basin and transit for the Giudecca Canal.

Currently, there have been protests from local, national and international public opinion against the passage of large ships in the San Marco basin⁶. The Port Authority has therefore proposed, and insisted on, an alternative access to the Stazione Marittima, traversing the entry to the Lagoon from the mouth of Malamocco, with transit along the Malamocco-Marghera canal and thence along a new canal to be dugged in the Lagoon, the Contorta-Sant'Angelo, to reach the Giudecca and the Stazione Marittima.

⁶ S. TESTA, *Invertire la rotta*, in this series, 2014.



1. Passengers arriving/departing/transiting in Venice Stazione-Marittima (from *Venice Terminal Passeggeri*, Statistics)

In the early 2000s there was a sharp rise in the passenger traffic via sea. The traffic involving transportation of passengers with cars increased only to a limited extent whereas the cruise traffic grew exponentially, inter alia because cruises had become a form of mass tourism. In 2012 the Port Authority stated that arrivals of cruise ships at Venice numbered 569 and mobilized 1,757,297 passengers. Of these, 11% were in transit, 89% were embarking and disembarking. As compared with previously, the average stay of the cruise ships at the Cruise Terminal in 2012 fell to 19.5 hours and the cruise tourists were concentrated in very large ships:

those with over 70,000 gross tonnage carried 70% of the total passengers.

What Venice earns from cruise tourism derives from the expenditures of the tourists and the crews in the historic city and from the dues paid by the shipping companies on entry/leaving, on mooring and on the cost of reprovisioning.

3.2. How much do tourists spend while visiting the city?

Estimates of the expenditure by cruise tourists for Venice are provided in a study performed for the Economic Commission of the EU⁷, in the perspective of a comparative analysis of the various European cruise ports. A distinction is made between tourists in transit and those embarking and disembarking in the port, for whom the port acts as home port⁸. In 2012 passengers in transit at Venice totalled 198,320, spending about eight hours in the city; those embarking and disembarking

⁷ *Tourist facilities in ports: the economic factor*, European Commission, Directorate General for Maritime Affairs and Fisheries, Policy Research Corporation, Brussels 2009.

⁸ Home ports are those where the cruises begin and end. In the home ports the ship reprovisions and the crew may change. It is essential for the home port to be close to an important airport. Ports of call are where the ship merely touches and remains for a few hours.

numbered 770,114: 60% of these did not stay overnight⁹. Cruise tourists staying in the city obviously spend much more than the rest.

The *per capita* expenditures are affected by the fact that Venice is more expensive than other port cities, and they take into account the variation in price levels from 2009 to the present. The results are reported as *per capita* values in table 2, where the overall spending is calculated at 120 million euros. This is well below the value found by the research commissioned by the Port Authority, whose results are based on data from a very limited survey performed by the said Authority in 2005, subsequently updated: a somewhat self-referential procedure¹⁰.

3.3. *The crew members also spend*

The crew members are estimated to spend 25 euros per call, obviously far less than the cruise tourists. The crews

⁹ Recently, Costa has expressed agreement with this figure, as can be read in the intervention in the Commission at the Chamber of Deputies reported by A. VITUCCI, *Orsoni e Costa. Scontro a Roma*, “La Nuova Venezia”, 1 Oct. 2013, p. 14; some months previously he had estimated the figure at 600,000-700,000 (COSTA, *Crociere a Venezia*).

¹⁰ C. DOSI, I. MUSU, D. RIZZI, M. ZANETTE, *L'impatto economico della crocieristica a Venezia*, Autorità Portuale, Feb. 2013, tab. 7 p. 20, estimates an expenditure of 189 million euros, which is itself only half of the figure presented by Costa in the introduction to *A Venezia dal mare*, eds. G. CHIELLINO, F. DI CESARE, C. FRISONE, Marsilio 2012 (Collana della Autorità Portuale di Venezia), p. 12.

	<i>Per capita expenditure*</i>	Transit tourists**	<i>Per capita expenditure*</i>	Home port tourists	<u>Overall expenditure</u>	
					Transit	Home port
No stay	78	198,320	59	462,068	15,478,316	27,509,385
One stay			221	231,034		51,089,374
Two or more stays			332	77,011		25,544,687
Total				770,113		119,621,762

2. Cruise tourist expenditure in the city, in euros.

* Data from *Tourist facilities in ports*.

** From DOSI, *L'impatto economico*, p. 21-22: computed on a total of 1,738,547.

average modest wages (a majority of the ships fly a flag of convenience, and the work contracts are in line with those of the countries of reference¹¹). The crew benefits from a large part of the ship's provisions. The crew members also work (on shifts) during the calls, therefore they have limited time for shopping, gondola tours, purchase of souvenirs or electronic items. The calls are not only brief but are also repeated, and this affects the spending. Indeed, each ship on average calls at Venice six times in a year, and the expenditures, of the aforementioned type, are generally performed only once – certainly not repeated at each call. The overall expenditure is calculated at 5.9 million euros¹².

¹¹ Bahamas for the majority of the *Royal Caribbean* ships; Panama for those of *Carnival* and *MSC Cruises*.

¹² Passages by crew members total 356,000, hence 59,000 persons

3.4. The shipping companies pay to arrive and stay at the Stazione Marittima

The ships are navigated by two pilots, towed by one or two tugboats, moored in dock and reprovisioned. The sums due for these operations have been calculated on data supplied by the Port Authority, together with the expenses of surveillance and maintenance, security services, baggage movement and fees for parking tourists' vehicles and for transit to the airport. The overall expenditure is calculated at 41.8 million euros¹³.

3.5. Provisioning by the cruise companies

Provisioning is an important item in analyzing the effects of the activities of the passenger port on the territory. Each cruise company develops an organization to supply its ships by precise, reliable procedures. Indeed, safety on board the cruise ship is an essential matter, concerning every single aspect of life on board (access, hygiene and environment, medical assistance) and requires precise management by the various firms throughout the supply chain, especially with regard to food. Navigation is only one aspect of this complex organization.

passing on average six times, of which two-thirds disembark; on each occasion they spend 25 euros. For details see G. TATTARA, *È solo la punta dell'iceberg!*, «Economia e società regionale», 3 (2013), p. 143.

¹³ DOSI, *L'impatto economico*, tab. 22, p 39.

The cruise market displays a high concentration of the shipping companies and two-thirds of it belongs to a small number of large groups. At Venice, 80% of all passengers transported is accounted for by three companies: *Carnival* (36%, with its associate *Costa*), *MSC Cruises* with a leading role in the Mediterranean (30%) and *Royal Caribbean* (14%). All of these are based outside Italy (and pay their taxes abroad) and their vessels fly flags of convenience. None of the large and medium companies provisions itself from the local market, all of them opting for logistics exclusively dedicated to themselves and managed directly by them. The lobsters come from Baltimore, the fresh vegetables from the Netherlands, the salmon from Chile, and so on. This for various reasons: 1) the fierce competition prevents a company from depending on services provided by an agency that also supplies its competitors – services that were formerly provided by the local maritime agencies; 2) the importance of certification of the supplies with regard to the food chain, whose products must be known to the operators on board; 3) the times requested for supply, which are very short and need perfect coordination. While some of these may be simple services, the risk of possible delay entails very high costs and the companies cannot run such risks.

The offer of the ‘cruise’ product is increasingly inclusive, comprising the transit, sometimes the flight to the port, the excursions in the port city, and other activities.

Hence this brings scant benefit to the port territory. History had accustomed us to a very different picture: ports used to determine the fortunes and prosperity of entire cities and regions, and represented the wealth of the territories where they were situated. But this is no longer the case. Nowadays “in the light of recent changes, the (positive) economic impact of a port tends increasingly to be externalized in the logistic chain”¹⁴. The producer is directly connected with the final consumer by the supply chain managed by the shipping company, thus bypassing the local territory.

4. Why do ships pollute the environment?

In Europe some 500,000 premature deaths per year are caused by atmospheric pollution¹⁵. Sea traffic is one of the main sources of pollution at global level. In port cities ships contribute massively to the pollution: the fuels used are on average 2,700 times dirtier than road fuels, and moored ships, often near to inhabited areas, always keep their engines running in order to power on-board

¹⁴ M. BENACCHIO, E. MUSSO, *Demaritimisation o Remaritimisation? L'evoluzione dello scenario economico nelle città portuali*, ed. S. SORIANI, in *Porti, città e territorio costiero*, Bologna, Il Mulino, 2002, p. 200.

¹⁵ See the research by the German environmental association NABU (*Naturschutzbund*), *Clean air for Europe*, in www.nabu.de

services. It is estimated that premature deaths in Europe attributable to ships number 50,000 per year¹⁶.

Among the main elements polluting the air are:

- sulphur dioxide, which is irritating for respiration and contributes to increase the death rates in the coastal areas of North America and Europe, and also, at environmental level, the acidification of the seas;
- nitrous oxide, which impairs pulmonary function, raises the risk of cardiovascular disease, and damages the environment producing eutrophization, acidification and the formation of photochemical oxidant and particulates;
- fine particles whose presence is positively correlated with the frequency of attacks of asthma, chronic bronchitis and lung cancer; children are especially affected¹⁷. The initial results of an ongoing study at the Helmholtz Institute, Munich, on *in vitro* lung cell cultures exposed to emissions from a marine diesel engine show that the health risks due to nitrous oxides and ultrafine particulate are very high.

¹⁶ www.airclim.org › *Air pollution* › *Air quality* › *Toxic air in Europe*.

¹⁷ On all these see J. J. CORBETT, J. J. WINEBRAKE, E. H. GREEN, P. KASIBHATLA, V. EYRING, A. LAUER, *Mortality from ship emissions: a global assessment*, «Environmental Science & Technology», 24 (2007), pp. 8512-18.

4.1. Air pollution

The object of this section is to calculate the polluting emissions of the cruise ships under investigation, according to the method developed for the European Commission¹⁸. The emissions derive from the combustion of the engines. Distinction is made between the main engines and the auxiliary engines, the latter producing the electrical power for the services of the ship; analysis is made of the combustion technology (diesel) of the engines, the time, the working regime and the exhaust gases. The emissions also depend on the kinds of fuel employed and their relative sulphur content¹⁹.

Cruise ships heading for Venice enter at the mouth of the Lido, transit through the Lagoon for just under 10 km. and moor at the terminal Stazione Marittima. The overall transit through the Lagoon, including manoeuvres, lasts from one hour to one and a half.

We proceed as follows: we imagine a typical ship having the average dimensions of those arriving at Venice

¹⁸ C. TROZZI, R. DE LAURENTIS, *EMEP/EEA. Air pollutant emission inventory guidebook*, cap. 1a.3.d., 2009 (www.eea.europa.eu › *Publications* › *Air pollution*).

¹⁹ The international legislation regarding pollution by ships is provided in Annex IV 19 May 2005 of the *Marpol International Convention 73/78* titled *Regulations for the prevention of air pollution from ships*.

in 2012²⁰ (65,059 gross tonnage), with each call lasting two and a half hours in approach²¹, one and a half hours transit and manoeuvre in the Lagoon, and mooring for 19.5 hours. During the stay in dock the ship's engines use fuel with 0.1% sulphur content (Marine Diesel Oil, MDO), whereas the fuel for cruising contains 3.5% sulphur (Bunker Fuel Oil, BFO): these are the limits established by law. The "Blue Flag 2" voluntary agreement requires fuel at 0.1% sulphur content also for transit in the Lagoon²².

According to the method just proposed, we obtain the following results:

- mooring: 23.70 tonnes, MDO 0.1%
- transit: 7.61 tonnes, MDO 0.1%
- cruise: 33.07 tonnes, BFO 3.5%

Our ship performs 569 calls at Venice in 2012. The total consumption of fuel is given by multiplying the preceding values by the number of calls.

²⁰ Average weighted by the number of calls. We know we are approximating, as the relation between gross tonnage and engine power provided in TROZZI, DE LAURENTIS, *Air pollutant emission inventory* (tab. 3-12) is exponential, but the linear approximation proves fairly acceptable.

²¹ An ideal radius is considered to be 50 km of a circumference with centre at the Cruise Terminal.

²² Agreement between the Cruise Lines International Association and the Venice Major, currently pending renewal. The companies declare their compliance in any case.

The main pollutants produced by a diesel engine are nitrous oxide (NO), sulphur dioxide (SO₂), carbon monoxide (CO), volatile hydrocarbons (NMVOC) and particulates (PM₁₀, PM_{2,5}). Add to these the emissions of ultrafine particles, persistent organic pollutants (like dioxin and furans), hexachlorobenzene, biphenyl polychlorinate and heavy metals: lead, cadmium, mercury, arsenic, chromium, copper, nickel, selenium and zinc.

Table 3 reports the total pollutants emitted by cruise ships in 2012 at Venice; these are limited to the ones for which we have available external cost estimates that can be used with some certainty and are specified in the second column²³. The overall cost of the pollutants emitted is estimated at 118 million euros.

Passage by the alternative route Malamocco-Marghera-Contorta does not alter the frame of reference: the duration of transit in the Lagoon increases, the approach decreases. Quite otherwise would seem to be the damage caused to the morphology of the Central Lagoon by this solution, the pre-project of which, presented by the

²³ The pollution produced by tugs is calculated by assuming a main engine power of 3MW (TROZZI, *Air pollutant*, tab. 3.6), an average time of 4 hours per call and two tugs. Data on costs are reported by M. MAIBACH, C. SCHREYER, D. SUTTER, H. P. VAN ESSEN, B.H. BOON, R. SMOKERS, A. SCROTEN, C. DOLL, B. PAWLOWSKA, M. BAK, *Handbook on estimation of external costs in the transport sector*, 2008 (www.ec.europa.eu, *Mobility and transport* › *Transport themes* › *Sustainable transport*).

	Estimated cost euro/tonne	Total pollutants emitted tonne	Ship			Tug	Overall cost in euros
			Moored	Cruise	Transit		
			Tonnes				
NOx	9,500	3100.0	1058.5	1492.3	339.9	209.3	29,449,050
NMVOc	1,100	107.8	37.8	50.8	12.1	7.1	118,580
SOx	8,700	1358.0	27.0	1317.3	8.7	5.0	11,813,730
PM ₁₀	159,000*	148.1	20.2	116.7	6.5	4.7	23,547,900
PM _{2,5}	397,400*	134.6	18.9	105.4	6.1	4.2	53,450,300
Total							118,379,560

3. Quantity and cost of pollutants emitted by a ‘typical’ ship and by tugs. 569 calls, 2012.

* External cost for metropolitan areas. Venice is included in the list of *Larger Urban Zones of Eurostat*, Urban Audit.

Port Authority, was rejected by the Commission for Environmental Impact Assessment (EIA) which noted that it threatens “to introduce erosive processes harming the bed of the Lagoon...of non temporary nature”²⁴.

A new large and deep canal, like the proposed Contorta, through which giant ships would navigate, will produce strong wakes that travel over the shoals, with

²⁴ From the Ministry of the Environment and Protection of Territory and Sea, General Directorate for Assessment of Environmental Impact to the Minister, Rome, 27 Sept. 2013, p. 7 (communication of opinion art. 9, DM 150.2007, Prot. CTVA 0003391). The Environmental Impact Assessment (EIA: Directive 85/337/EEC) is mandatory for a project like the excavation of the Contorta canal.

consequent erosion of natural canals (*ghebi*) and of adjacent shallows. This is proved by studies of two large canals (canale Vittorio Emanuele and canale Malamocco-Marghera) where the movement of vessels generates wakes that produce high, near bottom current velocities leading to substantial sediment resuspension and shoal erosion.

Is it possible to posit a future reduction in the pollution? The APICE project provides an evaluation of certain possible mitigating interventions, investigating the electrical power used by large passenger ships during their stay at the Stazione Marittima; these are based on the two projects, presented by the Port Authority and *Venice Terminal Passeggeri*, that use the Enel power station and a power station directly owned respectively. The study concludes, not very reassuringly, that “none of the mitigating interventions suggested for Venice is sufficient to contain the increase in emissions stemming from expansion of the port” up to 2020²⁵. Differ-

²⁵ S. PILLON, F. LIGUORI, S. PATTI, *Metodi e modelli per l'indagine scientifica su emissioni e concentrazioni in atmosfera: risultati principali per la laguna di Venezia*, in *Qualità dell'aria nella laguna di Venezia. Apice: verso una riduzione dell'inquinamento atmosferico*, eds. E. GISSE, T. QUAGLIA, Milano, F. Angeli, 2013, p. 87. See also by the same authors *Reducing atmospheric pollution in the Mediterranean port cities. The results of APICE project*. Feb. 2013, in www.Apice-project.eu

ent policies are needed: use of fuels with even lower sulphur content, catalytic exhaust filters, anti-particulate filters currently available and installed by certain shipping companies (e.g. *Carnival* for ships mooring in the United States, *Aida* for North European ports). These steps are not contemplated in the study by Venice Port Authority.

Exhaust fine particles kill

In 2013, the International Agency for Cancer Research²⁶ classified the fine particles produced by diesel engines as type 1 carcinogenic factors (the class including asbestos among other things). These particles consist, in general, of soot, aerosols, unburnt residues in the combustion processes, such as those occurring in fossil fuel engines, in domestic heating plant, industrial activities and so on. They are classified as PM_{10} , $PM_{2,5}$ e $PM_{0,1}$, according to their dimensions²⁷. Epidemiological studies have demonstrated a close link between premature mortality (cardiopulmonary problems and lung cancer) and the increase of concentration of ultrafine particles in the air. The smaller

› *Apice final results* › *Local emission inventory*. APICE stands for *Actions for the mitigation of ports, industries and cities emissions*.

²⁶ www.iarc.fr/media-centre.

²⁷ For the most part circular, with diameter measured in micrometers (millionths of a meter) i.e. thousandths of a millimeter.

the particles, the more deeply they settle in the lungs²⁸. Nanoparticles can penetrate directly through the skin, reach the circulatory and lymphatic system and alter the cell processes²⁹.

The concentrations³⁰ of PM_{10} are the only ones currently regulated: the mean annual value is limited to $40 \mu\text{g}/\text{m}^3$ and the mean daily value of $50 \mu\text{g}/\text{m}^3$ cannot be exceeded by more than 35 days per year. At Venice, the mean annual value stands above that threshold, while the daily value in 2012 was exceeded by twice the number of days allowed, as per measurements performed at the Regional Environmental Protection Agency (ARPAV) control station at Sacca Fisola, notwithstanding the station is not positioned according to the correct criteria for these measurements³¹. This overstepping of the limits has not induced the local administration to undertake

²⁸ CORBETT, *Mortality from ship emissions*, p. 8512 and U. FRANCK, S. ODEH, A. WIEDENSOHLER, B. WEHNER, O. HERBARTH, *The effect of particle size on cardiovascular disorders. The smaller the worse*, «Science of the Total Environment», vol. 409, fasc. 20 (2011), pp. 4217-4221.

²⁹ C. BUZEA, I.I. PACHECO BLANDINO, K. ROBBIE, *Nanomaterials and nanoparticles: Sources and toxicity*, «Biointerphases», 4 (2007).

³⁰ Concentration refers to the quantity of pollutant present in the atmosphere per unit of volume. $PM_{2,5}$ will be regulated as from January 2015.

³¹ The criteria required by Directive 2008/50/CE app. III, B.1 are not met, for the station is mainly upwind with respect to the transit of vessels and mooring of cruise ships.

any “Plan for air quality”, in disregard of the provisions of the EC directive³².

In the Comune of Venice, according to the APICE³³ findings on total anthropogenic PM_{2,5} calculated at emission, commercial ships account for 18%, passenger ships for 13% (8% with “Blue Flag 2”). This represents an important proportion as compared with road traffic (16%) and industry (13%).

That the large vessels constitute an important source of pollution is confirmed by the measurements performed by NABU on the nanoparticles³⁴; another important source are the *vaporetti* and private means of transport. The only healthy air turns out to be the one measured in the vicinity of the ARPAV official control station at Sacca Fisola! These observations place the blame fairly and squarely on the local politicians and the authorities responsible for safeguarding the citizens’ health, since the technologies for addressing the problem are well-known, have been tested, and cost little.

³² *Ibid.*, art. 22. The limits of nitrous oxide concentration are also exceeded: the hourly concentration should not exceed 30µg/m³ (limit for protection of ecosystems), whereas 88µg/m³ are recorded. *Campagna di monitoraggio della qualità dell’aria. Area portuale di San Basilio. Relazione tecnica*, ARPAV, Venice 2012.

³³ APICE, *Emission inventory. Methodology. Description. Final Report*, no date, fig. 5.3, p. 56, in www.Apice-project.eu › *Apice final results* › *Local emission inventory* and ARPAV, *Campagna di monitoraggio*.

³⁴ NABU, *Clean air*.

Climate change

The global warming caused by various types of transport can be attributed to greenhouse gas emissions (carbon dioxide, nitrous oxide and methane), to hydrofluorocarbons produced by heating equipment, and to pollutants from incinerators used on board large ships.

Estimates of the social cost of greenhouse gases vary greatly. Here, we opt for the flat-rate calculation adopted by the *External Cost of Maritime Transport* report³⁵, which finds that the greenhouse gas emissions, in all their components, have a social cost of about $\frac{1}{3}$ of the value ascribable to the overall pollution: for Venice the cost is estimated at 56.2 million euros.

4.2 Sea pollution

This derives from the emission by ships of substances that affect the natural features of the sea. The ships discharge solid refuse, waste waters, bilge waters and harmful wastes. The sea enacts certain defences against these, the most effective being the dilution of the polluting substances that, at least to some extent, lose their initial toxicity. Biodegradable substances are transformed by microorganisms into inorganic material, but the gradual

³⁵ Report prepared by Transport and Territory for the European Parliament, 2007, p. III.

increase of these in closed, shallow waters like the Upper Adriatic renders the sea's purifying activity insufficient, and human intervention, always expensive, becomes necessary.

The shipping companies are bound to treat wastes before dumping them in the sea at three miles from the coasts (at 12 miles if untreated); however, the treatments are of limited efficacy, and the wastes continue to be a source of external diseconomies for the collectivity and thus represent a cost³⁶.

Solid wastes

Ships are small towns and their solid wastes are similar to domestic ones: paper, plastic, glass, food, humid matter. When navigating in international waters, ships separate the organic portion of their solid wastes and this is shredded and dumped into the sea. In modern cruise ships the inorganic wastes are incinerated and the ashes are discharged in the sea, whereas in older ships they are unloaded in the ports. We have no data regarding pollution that may stem from the incineration of solid wastes on board – a fairly recent activity, that generates toxic

³⁶ R. A. KLEIN, *Getting a grip on cruise ship pollution*, «Friends of the Earth», 1 Dec. 2009, in www.foe.org › *Projects* › *Oceans and forests* › *Cruise-ships*. H. CARIC, *Direct pollution cost assessment of cruising tourism in the Croatian Adriatic*, «Financial Theory and Practice», 2 (2010), p. 161-180.

Pollutant	Production /passenger/day	Cost	Total cost in €
Solid wastes	5 kg	0,15 € per kg	996.092
Black waters	30 litres	0,05 € per litre	1.992.185
Grey waters	380 litres	0,01 € per litre	5.046.867
Bilge waters	10 litres	0,30 € per litre	3.984.369
Toxic wastes	0,16 kg	3,36 € per litre	713.999
Total			12.733.512

4. Analysis of costs of sea pollution from cruise tourism at Venice (2012) (data processing based on stock of passengers and crew, 1,328,123 units and stay of one day (mooring+ transit).

emissions such as dioxins, furans, heavy metals and other health-threatening particles³⁷.

Waste waters

Cruise ships produce three kinds of liquid wastes: black waters (sanitary facilities); grey waters (sinks, showers, bathtubs, washing machines, kitchens, deck washing, swimming pools, saunas, etc.); and bilge waters. The bilge is the part of the ship where oils, lubricants, chemical cleaning products, metal and glass fragments are collected. Bilge waters must periodically be pumped overboard, after being filtered.

³⁷ KLEIN, *Getting a grip*, pp. 3-5.

Equipment for treating waste waters is installed on board ships, but is often of insufficient dimension: various inspections have found that the black waters, after filtering, still contain a large amount of coliform fecal bacteria³⁸.

Toxic wastes

These are the by-products of various operations: cleaning, laundry, photocopying, printing, general maintenance, medical and other. They may contain heavy metals like lead and mercury, hydrocarbons, benzene, toluene and other harmful substances. Toxic wastes can only be disposed of on land with specialized equipment.

In addition, we must consider the discharge of the chemical components present in antivegetative paints, evaluated at 1 kg. of paint per day for the larger ships.

5. Advantages for few, costs for many

The elements of cost and earning mentioned above are summarized in table 5. From this we see how the environmental cost of cruise activities for the city of Venice (187 million euros) is similar to the revenues deriving therefrom (185 million euros), which must be downsized

³⁸ KLEIN, *Getting a grip*, pp. 6-7.

in consideration of the diseconomies of scale connected with the excess of tourism and evaluated, net of these external costs, at around 122 million euros.

In actual fact, many diseconomies have yet to be evaluated, and the costs we have identified are only the tip of an iceberg of much larger negative externalities. Among these we may recall the costs due to the deterioration of historic buildings caused by air pollution and by the shifting of large liquid masses following the passage of the ships, the damage resulting from erosion of the shoals of the Lagoon, the cost of maintaining and restoring the canal banks and the *fondamenta*³⁹. These costs, too, grow exponentially with the increase in size of the ships.

An evaluation of sustainability that took into account all the pollutants emitted in engine combustion (including ultrafine particles, heavy metals and dioxins), the risk of accidents and the other elements summarily listed above, would result in really exorbitant estimates of cost.

Cruise tourism at Venice has been presented by the local administration, the Port Authority, *Venice Terminal Passeggeri* and the trade unions as an opportunity wellnigh free of cost, to swell the income of the city and

³⁹ In Venice, the term *fondamenta* indicates a (pedestrian) street bounded on one side by water.

Revenues		Costs	
Tourism	125,1	<i>Air pollutio</i>	118,4
Nautical technical services and supplies	41,8	Sea pollution	12,7
Expenses for tourist transport	17,8	Greenhouse gases	56,2
Total	184,7	<i>Total</i>	187,3
Negative externalities		Other negative externalities	
Tourist congestion (50% of 125,1)	-62,5	Other air pollutants (dioxin, heavy metals, ultrafine dusts)	not evaluated
Revenues representing increase of wellbeing	122,2	Pollutants from on board incineration	not evaluated
		Damage to monuments	not evaluated
		Alteration of morphology of the Lagoon	not evaluated

5. Revenues, costs and benefits in millions of euros.

its jobs. This is far from being the case. The earnings stemming from increased tourist demand need to be downsized since they entail large external diseconomies and cruise tourism entails massive costs for health and environment.

There are alternative possibilities for developing the passenger port. Large ships can moor at a station outside the Lagoon, as happens with many other terminals at historic cities. A station of this kind would obviate serious risk and damage, and could maintain and even augment the earnings and jobs connected with the cruise industry – though it would leave unsolved the problems of excess tourist influx and pollution in the city.

In a situation like what we have described, where the external diseconomies do not weigh on their producers, the cruise companies and the port operators have every incentive to behave as free riders; the excessive offer of cruise activity threatens the health of residents and damages the marine environment and the entire historic city. Unfortunately, the vested interests are by now so strong as to turn the incentive into pressure and lobbying, with increasing jeopardy to the life of the city.

There is, however, a further important consequence from what we said above with regard to the distribution of the earnings. The costs of the mega-cruise tourism fall mainly on those who draw no direct benefit from the tourist activities deriving from cruises, e.g. the majority of the residents in the historic city, who have to bear an annual burden *per capita* of some 3,300 euros⁴⁰; this provides a partial indication of the deterioration of the quality of life borne by visitors and residents and ultimately translates into an increased tax burden at local and national levels. The earnings are shared among the owners of service agencies, the shipping companies, the suppliers to ships and those operating for tourism – individuals and firms that, in many cases, are not liable for

⁴⁰ Calculated by relating the total costs (187.3 million euros) to the total resident population (55,000 persons).

tax in the city or even in Italy, like the cruise companies and some large hotel chains.

Local public opinion has in recent years opposed the presence of large ships in Venice, based on the assumption that cruise tourism does not respect the environment and is irresponsible and short-sighted. In other words, there is good reason to fear that once the environmental quality and the attractiveness of a tourist destination have declined, tourists will abandon it in favour of a different port – and that this will be the fate of Venice. To continue to boost cruise tourism on large ships at Venice is senseless and economically mistaken.

Giuseppe Tattara

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