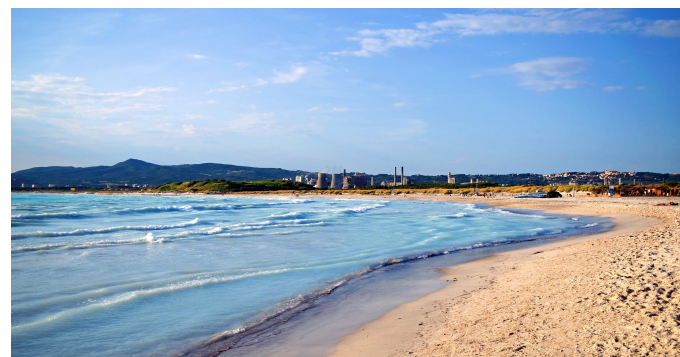




Progress beyond

Soda Ash Production in Rosignano

January 2022



Soda Ash Production



Soda ash is mainly used for the production of glass



Soda ash is produced with natural materials



From Limestone to Sand

A Safe and Controlled Process Using Natural Materials



1

Limestone is extracted from nearby quarry of San Carlo, Livorno Province

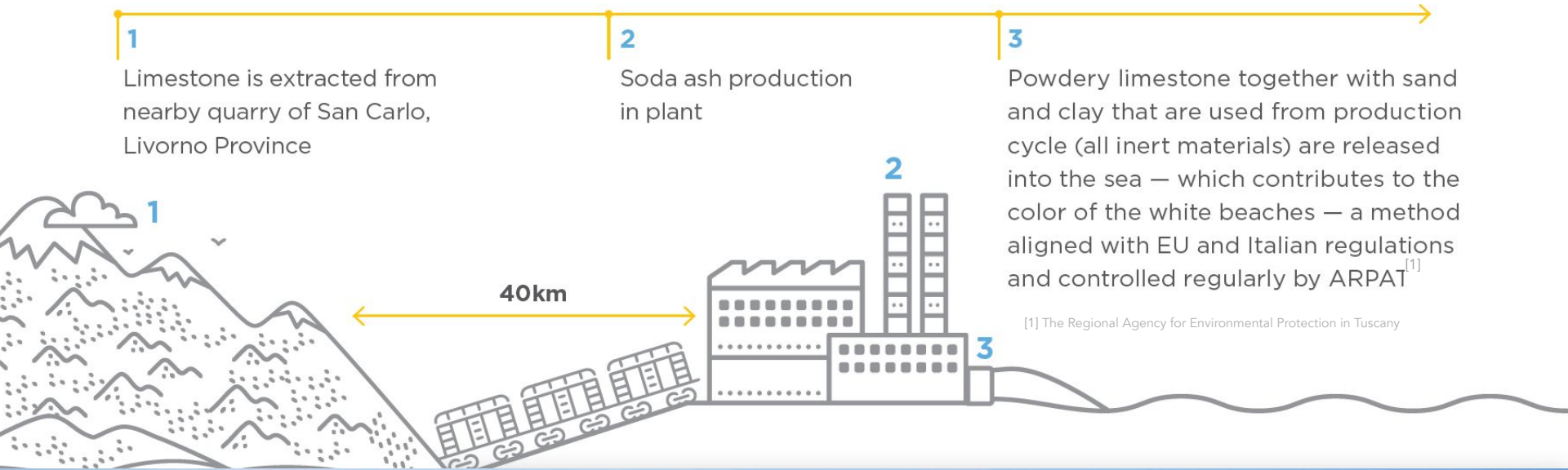
2

Soda ash production in plant

3

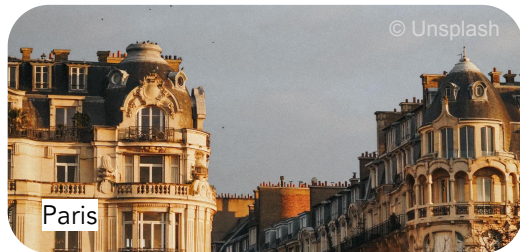
Powdery limestone together with sand and clay that are used from production cycle (all inert materials) are released into the sea – which contributes to the color of the white beaches – a method aligned with EU and Italian regulations and controlled regularly by ARPAT^[1]

[1] The Regional Agency for Environmental Protection in Tuscany



Soda Ash Process Uses Natural, Inert Materials

No heavy metals are used or added in process



- Soda Ash process requires solely **natural materials** including limestone
- Limestone is a **widespread material** that you find in most cliffs along the Tuscan coast and in buildings such as Paris' monuments
- Limestone, like many types of rock or stone, **naturally contains traces of heavy metals** that are imprisoned in the limestone - they cannot be absorbed by the body and are not harmful to living organisms, including people and fish
- At the end of the production cycle, **powdery limestone** mixed with gypsum, sand and clay - natural and inert materials - remains and is **released into the sea through an open channel** contributing to the color of the white beaches
- Both Solvay and the regulators (ARPAT, IAM-CNR) **closely monitor every step of the process**, as do independent academic institutions, which confirm that the effluent composition complies with the strict limits on monitored substances and offshore water quality is safe and similar to the rest of the Tuscan coast

Solvay's Effluent Release Method in Rosignano is in Full Compliance with EU Regulations and is the Preferred Solution



Solvay's soda ash production process is undertaken in full compliance with EU and Italian law – both national and regional.

This includes compliance with the IPPC¹ permit issued by the Italian government and renewed in January 2022.

The renewed IPPC permit confirms the direct release into the sea through an open channel is the 'Best Available Technique' as per the EU Commission's Reference Document.

IPPC Permit

The IPPC is the regulator responsible for overseeing environmental matters related to our industrial activity.

Under the terms of the IPPC permit, Solvay is required, every two years, to commission an independent and in-depth study on the impact of the facility's operations on the marine environment off the coast of Rosignano.

(1) Integrated Pollution Prevention and Control

Post-Production Disposal Techniques



Following every soda ash production cycle, there remains powdery limestone mixed with gypsum, sand and clay. These are all inert, natural materials – not toxic or dangerous.

There are several acceptable techniques to dispose of inert materials from soda ash operations, as outlined in the EU Commission's Reference Document on Best Available Techniques (BAT)^[1].

Each of the techniques was considered solely based on the characteristics of the location and alignment with BAT, not cost.



Dikes/Settling Pond



Pipes

(released offshore into the sea)



Open Channel

(released into the sea)

For a land-locked facility

For a facility near the sea

[1] The BAT notes that direct release into the sea may occur "by means of an open channel or underwater outfalls, designed with the necessary environmental and technical studies." (EU Commission's Reference Document on Best Available Techniques (BAT) in the Large Volume Organic Chemical Industry (2007 edition).

Open Channel Fully Compliant with BAT for Rosignano



Open Channel
(released into the sea)

Implementing the EU's framework for BAT depends on the unique characteristics of each location. Following discussions with local, regional and national authorities, and supported by independent scientific bodies, a [release to the sea through an open channel was confirmed to be the best and preferred solution for Rosignano, given that:](#)

- Underwater currents ensure that the non-toxic limestone does not accumulate (as required by BAT) but rather spreads evenly on the seabed; and
- The limestone that flows back onto the shore and the beach plays an important role in stabilizing the shore against erosion.
- These facts were confirmed in independent studies acknowledged in Solvay's renewed permit in January 2022.

This method is aligned with EU and Italian regulations and monitored regularly by ARPAT^[1]

[1] The Regional Agency for Environmental Protection in Tuscany

Other Techniques Were Confirmed Not to Be the Best Solution



Submarine Pipe



Where? Used when the discharge is made to the marine environment

What? Total dispersion of waste waters with an extended marine outfall. Discharge point is located to ensure that the natural currents disperse the waste waters into deep water.



Would be released into a protected marine area offshore and without the benefit of stabilizing the shore against erosion

Settling Ponds



Where? Used when the discharge is made to a freshwater body

What? Clarification by decanting large quantities of suspended solids from aqueous effluents. The height of the deposit can reach 25 – 40 m above ground.

The aqueous outfall is collected at several points through separators and drainage pipes to a peripheral channel collecting all drainage outfalls.

For a 500 kt/year soda ash plant, the necessary surface area for the pond in the settling phase is at least 15 – 30 ha



Technique rejected by authorities due to size, location and overall feasibility

Using Limestone to Fight Coastal Erosion is Well Established in Tuscany



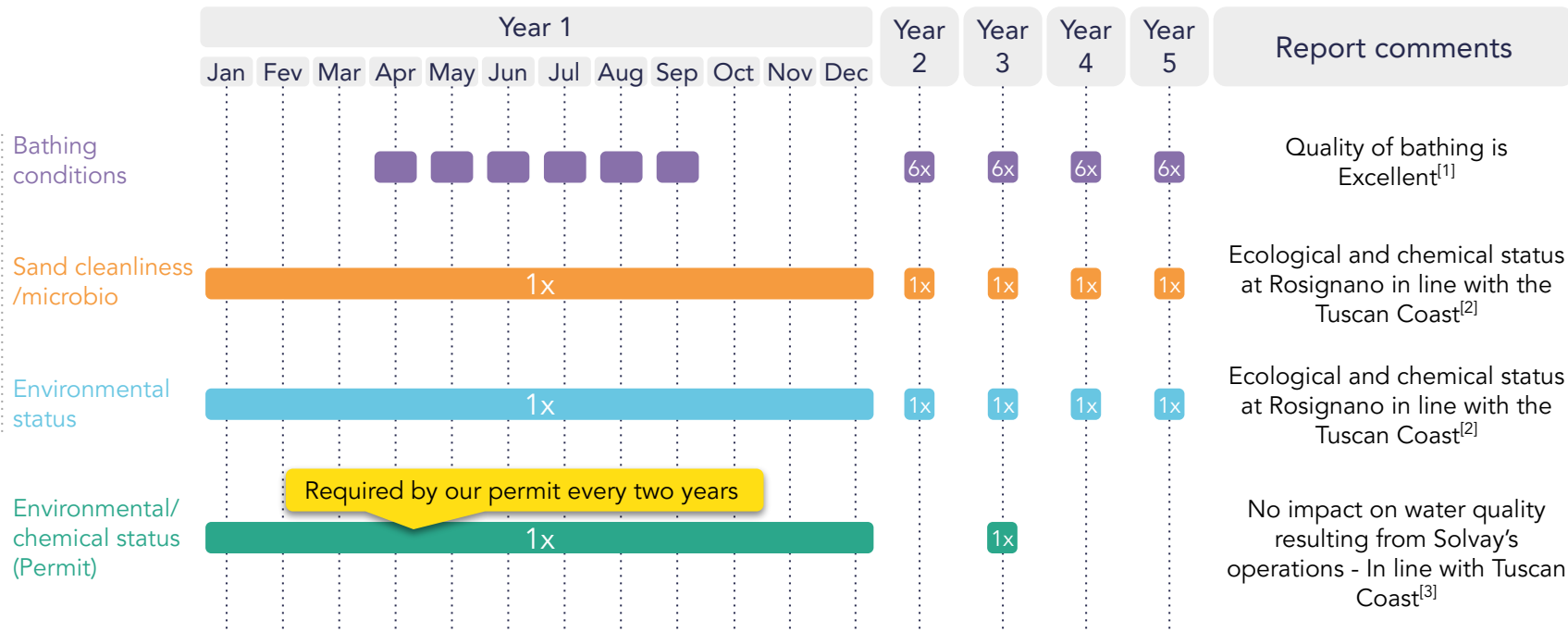
- Solvay's process in Rosignano plays an important role in stabilizing the coastline against erosion, which is a significant problem along the Tuscan coast.
- Sedimentation is a widespread solution to fight erosion in the Tuscan coast. Many municipalities use sand dredged from the sea bottom or from quarries to maintain their beaches and protect the coast from erosion.
 - For instance, near Carrara the authorities use residues from the marble quarry (which is actually limestone in a different geological form) to replenish beaches and support coastal stabilization (called Marble Beaches).
 - In 2019, the Marble Beaches project received the Premio Innovazione Tuscany Region award for its use in replenishing the beaches and supporting coastal stabilization.



Our Operations are Safe and Monitored Regularly by Scientific Bodies and Third Parties



Consiglio Nazionale delle Ricerche



[1] <http://www.arpat.toscana.it/documentazione/catalogo-pubblicazioni-arpat/rapporti-balneazione/il-controllo-delle-acque-di-balneazione-stagione-2020>

[2] <http://www.arpat.toscana.it/datiemappe/dati/stato-chimico-ed-ecologico-delle-acque-marino-costiere-della-toscana>

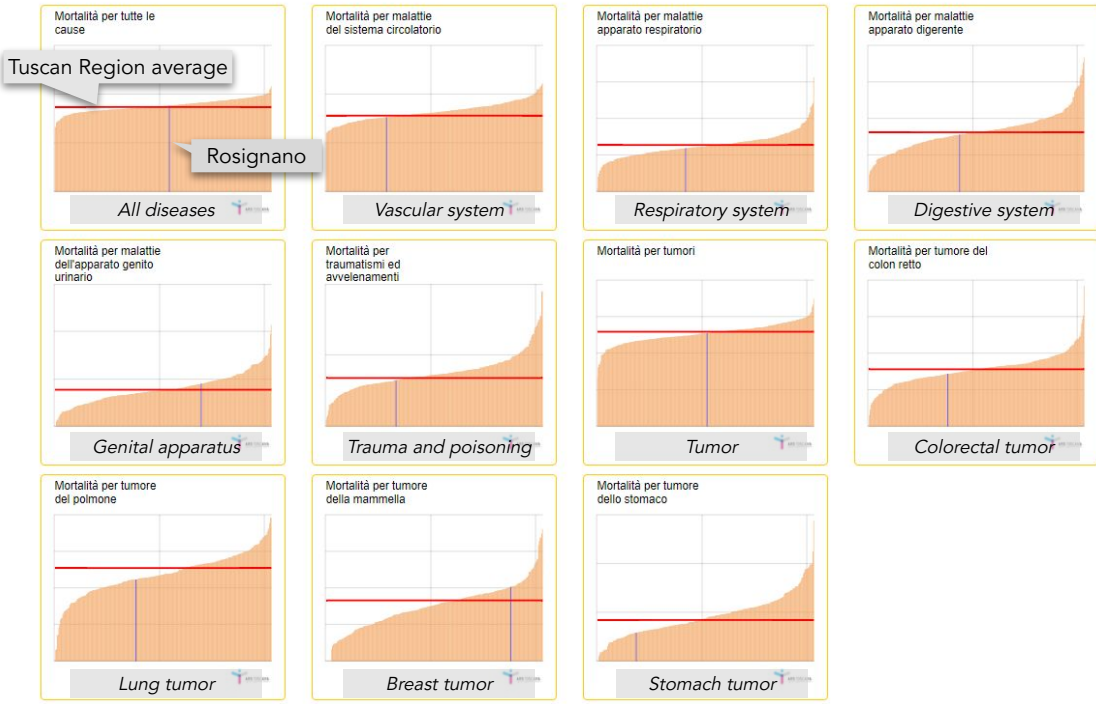
[3] IAS — "Monitoraggio dello stato di salute dell'ambiente marino nell'area antistante lo stabilimento solvay di rosignano"

Health of Rosignano Community In Line with the Region



Mortalita' Mortality

Solvay's translation - Cause of mortality



The regional health agency regularly monitors key indicators regarding mortality in many cities of the Tuscan Region.

From 2008 until 2017, mortality rates in Rosignano ranked average or below average in the Tuscan Region.

Source: Agenzia Regionale di Sanità della Toscana - Regional Health Agency - 2008-2017 figures

Continually Investing to Enhance Sustainability



Investments made

In line with our sustainability commitments, we have made significant investments in Rosignano over the past 20 years (>400m€) with a focus on:

- decreasing freshwater consumption
- lowering energy use
- reducing emissions
- increasing recycling

Converted power

generation from oil to gas, ahead of any climate regulation, making Solvay at the time among the first to use efficient gas-cogeneration to produce steam

20%

Reduction freshwater intake in the past decade

2.4 million cubic meters

Well water replaced with water recycled from the local municipal wastewater treatment plant since 2006

€40 million

Spent in 2018 on a high-efficiency cogeneration power plant that allowed Solvay to cut emissions by 40% in the past two years while producing the same amount of steam

Built a new plant

in 2019 for the capture, purification and liquefaction of CO₂ by 40 kilotons per year to reuse in bicarbonate production or sell to the market. Before that, liquefied CO₂ needed to produce bicarbonate was purchased and transported from the north of Italy, at a rate of 20 trucks a week.

Optimizing efficiency

Solvay's renewed IPPC permit confirms a maximum amount of suspended solids released per year¹. In an effort to continually optimize efficiency and sustainability, Solvay has committed to further study possible new technical solutions to reduce the quantity of suspended solids produced or released into the sea and to report its findings to authorities.

Thank You!

