

VENICE – A SINKING CITY

T.C. 10:00:00 START

1. TEASE: Computer graphics – aerial shots of Venice underwater.

T.C. 10:00:19 **Narration:** This is what could happen to Venice over the next few centuries.

T.C. 10:00:26 Once one of the richest and most powerful cities in the world, it ruled the Mediterranean for nearly a thousand a years and now attracts millions of visitors...But it could one day be completely submerged by the waters that surround it.

T.C. 10:00:43 The time has come for Venice to fight the most important war of its history.

2. INTRO

T.C. 10:00:56 Today more than ever, Venice is threatened by the very water that was once her lifeblood.

T.C. 10:01:08 Scientists around the world are fighting against time and the centuries old curse of rising waters and never ending floods.

T.C. 10:01:28 Ever since the 16th Century experts have battled the lagoon's water But every solution has collided with the city's thousand-year history and now must deal with the ravages of our twenty-first century culture.

T.C. 10:01:43 At the heart of the problem Venice's precious lagoon decimated by seafaring traffic, polluted by petrochemical factories and choked by sewage.

T.C. 10:01:55 Today, a unique technological effort is underway to save Venice's historical heritage. Rows of mobile gates, measuring in total 1.6kms are being built to protect Venice from the water that has made it famous.

T.C. 10:02:28 Sooner or later every large coastal city will have to confront the threat now facing Venice.

T.C. 10:02:37 Another iconic city, New Orleans, has already fallen to the ravages of water, despite the significant economic and technological resources in the United States.

T.C. 10:02:51 This is the story of the battle to save a treasure of humanity.

3. Venice by night

- T.C. 10:03:05 There is no ignoring the signs of the city's slow, silent and perhaps inevitable decline.
- T.C. 10:03:14 Venice is wasting away into the 550km² lagoon that surrounds it.

5. Lagoon and satellite shots

- T.C. 10:03:30 Satellite technology reveals the forces now threatening the lagoon, the largest marshland in the mediterranean.
- T.C. 10:03:44 The erosion of the natural sand dunes that protect the lagoon from the sea and from the tides pouring in through the three port inlets seem unstoppable.

6. Aerial shot of Venice and its lagoon

- T.C. 10:03:57 Venice lies powerless at the heart of a massive onslaught.

7. Amsterdam – Ext. beach

- T.C. 10:04:03 Pier Vellinga heads of the most prestigious European institute for coastal environmental issues.
- T.C. 10:04:12 **Vellinga:** The original idea is that lagoons are there and they stay for ever but through geological and biological research we have actually discovered how dynamic they are. We do understand now that lagoons come and go. It depends on the sediment carried by the sea and the river. It depends on the tide and wave forces. Venice lagoon is an example in itself.

9. Shot of the lagoon

- T.C. 10:04:43 **Narration:** But the lagoon as we know it today is mostly man-made. Without man's intervention, it would have disappeared long ago.

10. CGA morphing of the lagoon

- T.C. 10:04:54 If it had been left to its own devices, the lagoon would look more or less like this...half silted up and the other half transformed into a stretch of open sea.

11. Time lapse on the Grand Canal

- T.C. 10:05:03 But since the end of 14th century the Venetians have been diligently devising powerful hydraulic solutions.
- T.C. 10:05:11 Rivers such as the Sile, Brenta and Piave were diverted outside of the lagoon to stop its silting up.

T.C. 10:05:19 The lagoon is as artificial as the moat of a Medieval castle. It was so effective at keeping out the enemy that towers and ramparts would have been a waste of money.

12. Frari archives

T.C. 10:05:37 Ennio Concina has spent the whole of his academic career studying the city's history.

13. Maps of Venice

T.C. 10:05:43 **Concina:** In late Roman times the whole coastline along which the Venetians were beginning to settle was a huge stretch marshland, rivers and small islands that even back then was shrinking and all that's left today are the three isolated lagoons of Grado, Venice and Comacchio.

14. Camera boat

T.C. 10:06:06 **Narration:** Throughout Venice's history, the lagoon's waters have always been an imposing sea water barrier. The Venetians alone knew the secrets of its depths. This was a powerful weapon against enemy in times of war.

T.C. 10:06:22 As early as the 17th century, the Venetians knew that they would have to battle the lagoon if they wanted to save their beloved city.

15. Frari Archives – Int. day

T.C. 10:06:34 The early story of Venice's battle against flooding is locked away in the Frari Historical Archives. It is a battle that began with the creation in the 16th century of the Water Authority. Unique in its time, the institution's mission was to safeguard the lagoon and all the rivers flowing into it.

T.C. 10:06:58 **Schiavon:** This decree founded the water council. This book contains a record by the Republic of Venice's top ten ministers and dates back to 7 August 1501. They agreed to delegate a board of water experts who were to 'investigate the condition of the lagoon and its surrounding area from Malamocco to the three port inlets'.

16. Shot of Venice: St Mark's bell tower

T.C.10:07:27 **Narration:** The laws drawn up by the Water Authority were extremely severe.

17. Reconstruction: Prison of the Serenissima

T.C. 10:07:35 Anybody found causing damage to the banks of the rivers surrounding the lagoon or to the lagoon itself could be punished by the removal of an eye or the chopping off of the right hand.

18. Frari convent – Queen Margherita Room

T.C. 10:07:52 **Concina:** This map dates back to the mid-16th century. It is a remarkable and original map showing the city, lagoon and the surrounding area. Daniele Barbaro, a supreme expert of the period wrote that the ravages of time and the natural elements were at war with the lagoon and something had to be done to reverse its effects before it was too late.

19. Reconstruction II: Lagoon – Ext. day

Cristoforo Sabbadino on a fishing boat.

T.C. 10:08:22 **Narration:** The most serious threat facing Venice was the silting up of the lagoon and the solution was not an easy one.

T.C. 10:08:31 Cristoforo Sabbadino was the chief water engineer in the year 1542. It was his task to reverse the silting up. He firmly believed that the tides played a beneficial role in the lagoon's equilibrium.

T.C. 10:08:50 **Sabbadino:** To stay healthy the body needs lots of good food. This lagoon's food is the salt water that comes in and out of its inlets.
There are two ways of saving the lagoon: by reinforcing the sandbanks and most importantly, diverting all the rivers out of the lagoon.

20. CGA morphing of the lagoon

T.C. 10:09:13 **Narration:** Despite some opposition, Venice's rivers were diverted.

21. Views from helicopter

T.C. 10:11:18 Today the Sile, the Piave and Brenta rivers follow the very same course that was dug out for them in a massive engineering project planned by Sabbadino in the 1500s.

T.C. 10:09:33 Although the silting up of the lagoon had been averted another threat soon lurked: the seawater the Venetians engineers claimed was vital for the lagoon's survival, began to erode the outlying sand dunes.

T.C. 10:09:48 The lagoon was now in danger of being swallowed up by the sea.

T.C. 10:09:53 New ideas were urgently needed.

22. Reconstruction: Bernardino Zendrini

T.C. 10:09:56 Bernardino Zendrini was head water engineer from 1721. He believed that the solution wasn't to add more stones to shore up the banks of lagoon. Instead what was needed was a highly water resistant mortar to bind rocks that would be used to build dikes.

T.C. 10:10:15 He experimented with a mix of lime and a then new substance called pozzolana. He left a block of Istria stone bound by the his mixture in the lagoon. A year later he knew he was onto something. Nothing would split the block apart.

T.C. 10:10:33 **Zendrini:** This mortar is so tough that absolutely nothing will break it apart. What is so remarkable is that it can't be distinguished from the stone.

T.C. 10:10:49 **Narration:** This is what Zendrini's famous walls built in the 1700s look like today. His mortar has kept the sea and the lagoon apart for three long centuries, The natural sand dunes have almost completely disappeared.

23. B/W footage of 1966 Venice flood

T.C. 10:11:15 November 4 1966 was a day Venetians will never forget.

T.C. 10:11:22 In just a few hours the tide reached 194cm, and the seawater overran the city for 18 hours, inflicting excruciating damage to Venice's beautiful pallazzis.

T.C. 10:11:36 For the first time it became apparent to the Venetians and to the world that Venice could one day disappear underwater forever.

T.C. 10:11:46 But what exactly causes such terrible disasters?

24. CNR platform

T.C. 10:11:59 **13 km** from Venice, the National Research Council uses an offshore platform to collect all the meteorological data needed to predict the next high tide.

T.C. 10:12:09 **Narration:** Its main task is to monitor any sudden changes in atmospheric conditions that bring on a flood known in Venice as "acqua alta", high water.

T.C. 10:12:19 **CNR worker 1:** Have you checked the tidal graph?

CNR worker 2: A high tide is on its way.

25. Time laps of the moon

- T.C. 10:12:30 The various phases of the moon together with the alignment of the planets determines the ebb and flow of tides
- T.C. 10:12:38 The moon can bring about an 80cm rise in the sea level in Venice. These are known as 'astronomical tides' and their future occurrences have already been charted.
- T.C. 10:12:52 Exceptionally, high tides are caused mainly by two other factors: low pressure and sirocco winds.
- T.C. 10:13:03 The worst incident on record was the 194cm high waters of November 1966. The winds instigated a 140cm water rise, the rain and low pressure a further 44 cms but the astronomic tide only 10cm.
- T.C. 10:13:25 Venice might never have recovered, if in November day the astronomical tide, had actually peaked at 80cms, the sea level then would have reached the catastrophic 264 cms.

26. Camera boat: Venice at dawn

- T.C. 10:13:43 The warning is given in Venice when a tide above the danger level is forecast.

27. Venice city council – Tidal centre

Tidal Centre worker 1: ...

- T.C. 10:13:50 **Narration:** A team from the city council, monitoring tide levels around the clock, raises the alarm and keeps the locals regularly updated.
- T.C. 10:14:00 **Tidal Centre worker 1:** This is 7.45 forecast. The high tides maximum pick is expected this morning at 10.50 and it will reach 110 cm over the average.

28. Acqua alta in Venice

- T.C. 10:14:14 **Narration:** The high water is a massive headache for the city. A high tide of 80cm above the average sea level is enough to cause the water to seep into St Mark's Square.
- T.C. 10:14:25 The Venetians have always found inventive ways of fighting off the water, but statistics show that such tides will become increasingly common over the years to come.

T.C. 10:14:37 As the ground subsides and the water level continues to rise, Venice and its lagoon are increasingly under threat.

T.C. 10:14:46 St Mark's Square is the lowest lying area of the city and is flooded when the tide reaches a height of 80 cm, which occurs about 40 times a year. A century ago 100 cm tides were extremely rare but now they occur an average of seven times a year, completely submerging the square.

To protect the square from these floods, the Water Authority began a series of renovations in march 2003. They are raising and consolidating 150m of boardwalk, constructing a new rain water drainage system and restoring the paving.

T.C. 10:15:05 Forecasts show that exceptionally high tides equivalent to the 1966 flood could strike at any time.

29. Reconstruction III – Canaletto

T.C. 10:15:43 Antonio Canal, better known as Canaletto, is one of Venice's most famous artist. He lived in the 18th century and specialized in Venitian landscapes and scenes of daily life.

T.C. 10:15:5 But he was always short of money. His only way of paying his debts was to speed up his work with the help of a homemade dark room where he drew onto frosted glass the canal and the facades of palazzis.

T.C. 10:16:28 Canaletto's highly realistic photographic paintings reveal vital information on the level of the sea in his day. His paintings show that the banks around the Rialto Bridge were much higher than they are today.

30. Camera boat – Grand Canal

T.C. 10:16:48 The line of green algae left behind after the tide has receded, is proof that the city has subsided over the years.

T.C. 10:17:02 The algae shows how high the tide now laps up against the palazzi's foundations and doorways.

T.C. 10:17:10 There's no telling for certain how much the city has subsided since Canaletto's day, but it could be by at least half a metre. The steps once used for boarding the boats are now underwater and covered in algae.

31. St Mark's Basilica – crypt

T.C. 10:17:31 Ten steps lead down into the crypt of St Mark's Basilica.

T.C. 10:17:36 Waterproofing the whole crypt to make it accessible was a gigantic task.

T.C. 10:17:42 When the basilica was built 1200 years ago it stood 1.5 metres above sea level but today it stands 18cm underwater. If it weren't for the non-stop water pumps this floor would be continually flooded.

T.C. 10:18:01 It seems that Venice has been sinking into the sea from the very start. But why?

32. Venice – Ext. day

T.C. 10:18:07 It's hard to imagine but the islands upon which Venice is built are made of mud.

T.C. 10:18:15 This canal has been drained for maintenance work. The banks are covered with solid stone but behind them lies a dense larch wood forest.

33. CGA work site and wooden piles

T.C. 10:18:37 The soft mud of the banks has been reinforced with thousands of long tree trunks which support the entire city.

T.C. 10:18:50 Layers of Istria stone rest on top of the trunks and isolate the palazzi from the sea water.

T.C. 10:19:06 Several times a year the tide rises above this stone barrier.

T.C. 10:19:18 The salt water seeps up into the walls and into the narrowest cracks in a capillary-like action.

T.C. 10:19:25 As the water dries it expands like ice and crystallises. With every new flood the salt dissolves once again, bores a little more into the stone and eventually causes the wall to crack.

T.C. 10:19:39 Over the years the stones begin to crumble like biscuits.

T.C. 10:19:50 And once again the green strip of seaweed shows exactly how often the high tide rises above the Istria stone barrier.

35. Infrared shots

T.C. 10:20:02 The infrared camera reveals what's invisible to the naked eye.

T.C. 10:20:07 The camera is sensitive to temperature changes to a tenth of a degree. The blue tones at the bottom of the scale indicate the coldest layers whilst the white and red show the warmest.

T.C. 10:20:26 This allows us to follow the water's rise up the wall.

T.C. 10:20:33 The low water temperatures of the canal indicated in blue creep up the building.

36. CGA Venice underwater

T.C. 10:20:39 Every single acqua alta or high water threatens the palazzi's walls and structure.

T.C. 10:20:55 And just round the corner lurks the threat of a two metre high flood.

37. Rotterdam mobile gates

T.C. 10:21:42 Like Venice, Holland has been fighting the fury of the seas for hundreds of years. Since the mid 17th century water in regions below sea level has been pumped out by a battery of windmills working in unison.

T.C. 10:21:55 Wooden gears transfer the energy from the windmill's blades to a metal wheel which lifts the water and pushes it into a network of raised canals built with reinforced banks.

38. B/W shots of Dutch flood

T.C. 10:22:14 In January 1953 winds of 200 km/h together with an exceptionally high tide hit the Dutch coast causing the banks of the canals to cave in.

T.C. 10:22:27 1,835 people were drowned and 70,000 were left homeless. A third of the Netherlands found itself under water.

T.C. 10:22:44 To subdue the rise of water the Dutch came up with a solution from which Venice is drawing a lesson.

T.C. 10:22:55 Since 1997, these enormous metal gates have been defending Rotterdam and the North of Holland from the North Sea. Each gate is 237 metres tall or as high as the Eiffel Tower.

T.C. 10:23:10 Arguably they're a bit of an eyesore but according to Pier Vellinga if they're unbeatable.

T.C. 10:23:19 **Vellinga:** When the North Sea is rough we are very vulnerable. We had the choice between raising all the dikes 3/4/5 metres and rebuild part of the old cities or a one time a mobile barrier. And the population was in favour of this mobile barrier because it is safer and it has a lesser effect overall on the landscape.

T.C. 10:23:48 **Narration:** Two semi-circular barriers lie in a dug out canal on the banks of the Schelda river. When necessary the huge arms rotate towards the centre of the river until they almost meet in the middle.

- T.C. 10:24:06 Then they slowly sink down into the riverbed.
- T.C. 10:24:12 The huge engineering feat was completed in record time. Work went on day and night for six years to finish these huge reinforced concrete barriers. They need to withstand the full force of the high tides, calculated to reach a maximum of 30,000 tons.
- T.C. 10:24:31 The gates haven't yet been put to the test but it is predicted they will be used on average once every 10 years.
- T.C. 10:24:45 Rotterdam sleeps soundly now that its mobile gates control the quantity of water entering the city.

39. Shot of Venice

- T.C. 10:24:55 A similar solution is now being implemented in Venice
- T.C. 10:25:03 Andrea Rinaldo of the University of Padua and Chiang C. Mei of the Massachusetts Institute of Technology were both appointed to assess the flood barriers project.

40. University of Padua

- T.C. 10:25:19 **Rinaldo:** If we really mean to save the city from these exceptional high water, then the only technically possible solution is to temporarily cut off the sea from the lagoon.

41. Venice lagoon seen from space

- T.C. 10:25:33 **Chiang Mei:** The idea to protect Venice's lagoon from the onslaught of storm tides from the Adriatic Sea is to build a series of barriers across the inlets.

42. CGA Mobile gates project

- T.C. 10:25:49 **Narration:** Finally, in 2003, the Italian government began construction of a series of mobile barriers at the bottom of the lagoon inlets that will rise up when necessary to stop the flow of the tide.

43. Voltabarozzo Experimental Centre

- T.C. 10:26:25 In Voltabarozzo on the outskirts of Padua in an enormous hangar as large as a football pitch, the water council has built a plastic model of the whole of Venice's lagoon. Built to scale, it accurately reproduces the tidal flow in the lagoon.
- T.C. 10:26:46 All the theories on the lagoon's ecosystem have been tested here.

- T.C. 10:26:56 Scaled-down waves reproduce the effects of a mighty sea storm.
- T.C. 10:27:04 The basin tests the swell response of the barriers.
- T.C. 10:27:11 It is a major technological feat. The lagoon meets the sea at three very wide inlets: Chioggia 380 meters wide, Malamocco 400 meters wide and Lido 800 meters wide. 78 mobile flap gates measuring a combined width of 1600 metres will be needed to control the flow of the water.
- T.C. 10:27:43 When tides above the danger level are predicted, compressed air will expel the water from the flap gates, lifting them up from bottom of the lagoon's inlets.
- T.C. 10:27:53 Once the gates are built, they will form a serpentine wall of independent segments capable of controlling extremely high tides of up to 3 metres.
- T.C. 10:28:04 **Chiang Mei:** Because the gates are allowed to swing back and forth with the waves the large wave forces are born mostly by the water on both sides and not very much is transmitted to the supporting structure. In this aspect I think this is very very clever.
- T.C. 10:28:24 **Narration:** The mobile gates have been designed to not interrupt the tidal flow except in exceptional circumstances.
- T.C. 10:28:33 This is essential for the welfare of Venice because four times a day, the rise and fall of the tide brings clean seawater into the lagoon feeding its flora and wildlife.
- T.C. 10:28:46 Reducing the water flow would soon cause the lagoon to die from lack of oxygen.
- T.C. 10:28:59 The lagoon has its own breathing mechanism. These jagged interdependent islands act like huge lungs, filtering and purifying the lagoon's water. They are called 'barene', a special sorts of sandbank, that possess a whole life of their own.
- T.C. 10:29:19 The vegetation on these sandbanks traps sediment carried into the lagoon by the rivers, allowing for the sandbanks to grow in harmony with the level of the water.
- T.C. 10:29:30 If a sandbank cannot grow it will die.
- T.C. 10:29:34 But now there is a negative balance; the lagoon loses more sediment to the sea than it is gains from the rivers. As a result, these sandbanks structures have been eroded and tend to disappear.

T.C. 10:29:46 **Rinaldo:** If the lagoon had been left to evolve naturally it would have disappeared centuries ago. From a historical, engineering and scientific points of view, we should decide what kind of lagoon we want and then do all we can to realise this. But this means taking action, rather than leaving it alone.

45. Venice lagoon

T.C. 10:30:10 Works are underway to rebuild the sandbanks using clumps of sparteine weeds. Already, hundreds of square meters of barene have been protected from erosion and along the littorals 45 kilometres of new beaches have been reconstructed.

T.C. 10:30:20 Such measures are helping to re-establish a healthy ecological equilibrium in the lagoon.

T.C. 10:30:32 While scientists look for ways of protecting the ecology of the lagoon, work has begun on controlling the high tides.

T.C. 10:30:43 But such is the concern for the ecosystem that even the construction of the gates has been designed to minimize environmental impact.

T.C. 10:30:53 Construction materials and heavy machinery are being brought in by sea and operated from barges to avoid damage to the fragile shoreline.

T.C. 10:31:03 Already breakwaters south of the inlets have been constructed.

T.C. 10:31:09 Reaching up to 1300 meters out into sea they are designed to abate the intensity of tidal currents and attenuate the incoming waves.

T.C. 10:31:26 To accommodate the mobile flood gates at the entrances of the lagoon, the jetties have been reinforced and the bottom of the inlets have been protected.

T.C. 10:31:36 Each flap of the gates will be 20 metres wide but vary in height according the depths of the lagoon at each inlet.

T.C. 10:32:02 Whenever the natural elements conspire to create an exceptionally high tide, the gates will rise and so prevent the high tide from flooding the lagoon.

T.C. 10:32:18 The lagoon will thus be safeguarded from the threat of high water.

T.C. 10:32:25 But what happens to ships that need to enter the lagoon and reach the port when the gates are raised?

- T.C. 10:32:31 **Alberto Scotti:** We had to consider access for small boats, which can not stay in the open water during bad weather. They will be able to access the lagoon via small entrances right next to the mobile gates. They are planned for all three inlets: Chioggia, Malamocco and Lido.
- T.C. 10:33:05 **Narration:** But how about ships of larger dimensions?
- T.C. 10:33:07 Even though staying in the open sea doesn't pose a big risk for large ships, a big lock has been constructed at Malamocco to allow them to pass through the inlet and reach the industrial area of Marghera.
- T.C. 10:33:19 A brand new 3D Simulation Centre is already operational for the training of pilots to navigate safely through the inlets during construction and operation of the mobile barriers.
- T.C. 10:33:43 **Alberto Scotti:** The Simulator's purpose is to make sure the project works as intended. It allows the ship pilots to deal with unexpected situations and to practise navigating through the lagoon's inlet in a simulated environment.
- T.C. 10:34:12 **Narration:** Building these mobile gates is a major undertaking. In addition, an artificial island will be built at the Lido between two canals with different depths.
- T.C. 10:34:28 But the construction of the entire project will only be completed in 2012
- T.C. 10:34:35 What is Venice doing about its problems in the meantime?

46. Venice

- T.C. 10:34:39 Venice might look like it was founded in the 1500s, but it has actually been around for more than a 1000 years.
- T.C. 10:34:47 The city does not look as ancient as it really is, because the Venetians' way of tackling the erosion was to knock down the old palazzi and construct on top of the rubble.

47. Santa Maria Apollonia cloister

- T.C.10:34:59 Marino Folin is an architect born in Venice. This is one of the city's most precious architectural jewels. Five steps lead down into the cloister from the street above.
- T.C. 10:35:14 **Folin:** Santa Apollonia is Venice's only remaining example of a Romanic cloister. In recent times the floor has been raised up to here to the level of the columns to save it from the high tides. This part here was completely piled up with earth. Are we really serious that the same can be done throughout Venice?

T.C. 10:35:42 **Narration:** Today Venice would much prefer to uncover what has been filled in over the centuries.

48. Venice – Giudecca

T.C. 10:35:56 **Narration:** But until it can totally be protected from the onslaught of the water, the city has no choice but raise its pavements above it...and there are areas within the city where it's possible to regain those lost centimetres without spoiling the area's architectural beauty.

T.C. 10:36:16 Such projects are underway throughout Venice.

T.C. 10: 36:24 The Zattere district has been successfully raised.

T.C. 10:36:32 But raising all the pavements is easier said than done.

T.C. 10:36:39 **Chiang Mei:** It may take 60 years to complete the raising of most of the city with lots of interruptions. It would disturb and change the city for the worst for a long time. I don't think it's a very practical idea.

T.C. 10:36:53 **Narration:** The situation gets worse every year.

T.C. 10:37:06 In the year 2002 Venice was flooded twelve times by tides above the danger level. Raising the gates twelve times for four hours would have been enough to keep the city dry.

49. Paolo Pirazzoli of CNRS

T.C. 10:37:30 Paolo Pirazzoli was born in Venice and now works at the French National Research Council (CNR). Saving his hometown has always been one of his life's missions. He has become one of the most outspoken opponents of the MOSE, the mobile gates project.

T.C. 10:37:48 **Pirazzoli:** In theory the Mose project with the help of precise meteorological forecasts could in theory put an end to the high tides. But in practice the project has quite a few drawbacks. It's an extremely complicated project. It's both fragile and expensive in terms of its construction and maintenance. Also it would have a negative impact on the environment and seafaring traffic.

50. Dikes on the Schelda

T.C. 10:38:17 The Mobile Gates project waited for many years before it received the green light. In 1996 when arguments reached their peak, a commission of experts was set up to evaluate its

environmental impact. Pier Vellinga was one of its most authoritative members.

T.C. 10:38:34 **Vellinga:** We were very surprised to find that some people were in favour of protecting Venice while the environmental movement was very much against at seeing it as an interference of nature. We analysed the problem in depth with various studies and came to the conclusion that the mobile barrier would have a beneficial effect both for the city and the lagoon. This is because it could help to manage the quality of the lagoon.

51. Aerial shots of the lagoon

T.C. 10:39:10 **Narration:** But environmentalists still believe that the mobile gates project is nothing more than a harmful white elephant.

T.C. 10:39:21 Instead they have proposed a series of so-called soft options.

T.C. 10:39:25 Such as removing the banks around the fish breeding grounds, thereby enabling the tide to spread out over a wider area.

T.C. 10:39:37 But Calculations showed that this would reduce the level of water at Venice's lowest areas by just 2 centimetres.

52. Aerial shot of St Mark's Square

T.C. 10:39:51 Another solution will be to close the inlets whenever the tide inside the lagoon is expected to rise above the alarm level.

This will be done by positioning 12 120m-long vessels across each of the 3 inlets to provide temporary closures.

The steel vessels will be manoeuvred into position to form either partial or full barricades against the tide.

Each vessel is fitted with enormous ballast chambers that can be filled with water to lower the hull so that it rests on the lagoon bottom and seals off the inlet. After the danger passes, the vessels can be pumped dry and floated out of the way again.

T.C. 10:40:12 Not enough to deal with the already documented rising water....not enough to accommodate a storm surge that could leave Venice as wounded as New Orleans was when Katrina lifted the waters from nearby Lake Pontrachairn, overtopped the levies and flooded the historic city, killing nearly 2 thousand people and leaving hundreds of thousands homeless.

T.C. 10:40:59 For many, Venice is running out of options, if not time.

54. Acqua alta – time lapse

T.C. 10:41:06 **Narration:** ...and without the exchange of water the lagoon doesn't stand a chance. Everyone agrees on one thing: something must be done to stop the water from flooding Venice.

T.C. 10:41:12 Venice has yet to come up with any definitive foolproof solution. Its problems are unique.

55. London

T.C. 10:41:22 **Roswell:** London is different. If you look at London it's a world city and a huge financial centre. If this were flooded by a storm surge from the east coast it would cause immense and devastating economic damage. That is a risk that the British government could not take.

56. Thames barrier

T.C. 10:41:47 **Narration:** The Thames Barrier has stopped the water from the North Sea from flooding the heart of the city since 1982. In the 20 years that followed its construction, it was raised 25 times.

T.C. 10:42:07 **Roswell:** Venice is different because the Venetians have adapted to the flooding. They are used to living by the waterside. They know what the acqua alta means to them.

T.C. 10:42:17 **Narration:** On the night of November 6th 2000 a modest high tide of 110 cm was forecast but without warning

T.C. 10:42:27 ...the tide rose to 145cm and kept on rising. The Venetians feared a repeat of the 1966 disaster.

T.C. 10:42:36 But fortunately the wind dropped all of the sudden and within a few hours the situation was under control.

57. Meeting room of Consorzio Venezia Nuova

T.C. 10:42:50 Shortly after, experts at the Consorzio Venezia Nuova, the body appointed by the Venice Water Authority to defend the city from the high tides, simulated the storm to see how effective the mobile gates would have been.

Int. Meeting room

T.C. 10:43:08 **Consorzio expert:** The gates would have been shut for 9 hours and the water level in the lagoon would have reached not more than 90cm.

T.C. 10:43:19 **Narration:** The mobile gates will be completed in 2012, hardly a long time considering the huge undertaking. But much too long has in light of the unsettling forecasts for the future.

57. London

T.C. 10:43:32 **Roswell:** I think scientists more or less on the predictions for sea level rise agree that it is happening and it's happening now. It'll be 50cm for the next 50 years maybe more and beyond that upwards of a metre maybe a metre and a half.

T.C. 10:43:53 **Narration:** Already global warming is causing havoc around the world....Over the last 10 years alone, the rising levels of rivers in Europe have led to deadly floods and cause incalculable damages.

T.C 10:44:36 **Roswell:** Venice is a trigger. It is the first major city in the world to face sea level rise because it is built at sea level. So people see in Venice something that could happen elsewhere and probably will happen elsewhere if our sea level rise projections are accurate.

T.C. 10:45:00 **Narration:** What fate awaits Venice two or three hundred years down the road?

T.C. 10:45:06 **Roswell:** A permanent solution for Venice must be to progressively seal off the lagoon from the sea. That is the only thing that can be done to protect Venice in the long term. But in order to do that, you have to solve the pollution problem. Because without that, you have an environmental catastrophe.

58. Shots of Porto Marghera

T.C. 10:45:27 **Narration:** Since the 1930s Venice has lived alongside one of Italy's largest petrochemical centres, Porto Marghera.

T.C. 10:45:36 This vast area has mushroomed along the edges of the lagoon dumping all kinds of pollutants into it.

T.C. 10:45:42 Oil tankers sail into its industrial port every day from all corners of the world. If just one of these tankers were to spill just a fraction of its load the consequences would be catastrophic.

T.C.10:46:06 The infrared camera monitors the water condition from the outlying lidos to the inner corners of the lagoon to determine the quantity of pollutants present in the water around Venice.

T.C. 10:46:22 Although a clean-up program is underway, 10% of the lagoon is still seriously polluted with mercury, arsenic, heavy metals and polychlorides, those infamous PCBs. Local agriculture dumps

over 6000 tons of nitrogenic substances every year, not to mention all the waste from the city's drains.

The Venice Water Authority is taking measures to prevent the dispersion of industrial residues and contaminants that have accumulated over the years in former dumps and canals around Marghera Port and the chemical industries that it hosts.

59. Dikes on the Schelda

T.C. 10:46:50 **Vellinga:** It will take 20 or 50 years to make our economy cleaner so that the lagoon is healthier. Cleaning up the lagoon, I think, will take about 50 years. I think the city and the lagoon are inseparable so I don't think we should decide either the lagoon or the city. With these mobile gates you have the most flexible solution to do both.

60. CGA Mose

T.C. 10:47:18 **Narration:** The mobile gates are not Venice's ultimate solution. But the scientists agree that it could offer the city 100 years' peace of mind.

T.C. 10:47:29 That's the time the local authorities would need to complete a courageous relocation project to move the industry away from Porto Marghera, rethink the entire region's agriculture and divert the seafaring traffic from Venice to other nearby ports.

61. Acqua alta in St Mark's

Cruise ship sails past

T.C. 10:47:49 **Narration:** One day Venice's nightmare could become a thing of the past but in the meantime it must somehow or other survive these really bizarre times. Day by day it becomes more and more like a huge theme park and less and less like a city for its own people.

T.C. 10:48:06 Millions of tourists from all over the world flood into the city, while the locals just can't wait to get out. A few decades ago 150,000 people lived here, this has now fallen to 60,000 or even less.

T.C 10:48:46 Until the completion of the project, the tides will continue to wash in and out of the lagoon twice a day, keeping Venice, its inhabitants and its priceless artistic heritage under the threat of a watery grave.

62. CGA Venice underwater – computer graphics

T.C. 10:50:09 QQH **END**