

## RESPONSIBILITY FOR THE DISASTER

This section will assess the extent to which the landslide was foreseeable, and the role played by geologists in forewarning of the disaster. The next section will give technical details of the site geology and slope stability, together with an assessment of the scientific value of the available information.

### Pre-Existing Studies and Recommendations

Two fundamental long-term causes of the Ancona landslide are the removal of material from the base of the slope (thus oversteepening it) by longshore drift in the Adriatic Sea, and the effect of deforestation in increasing infiltration on the slope and decreasing surface cohesion. In 1397, the Statuto del mare of Ancona prohibited the removal of stones from the natural mole along the shore at this point, but longshore drift has continued unabated. The period in which deforestation occurred is not certain, but slope instability was well established by the nineteenth century. The first report on the Barducci landslide was written in 1859 and other reports followed in 1920 (Brighenti, 1920), 1940 (Vecchiarelli, 1940), 1958, and 1960 (Selli, 1960). A major study of the area was carried out at the beginning of the century by Claudio Segre, an engineer of the Ferrovie dello Stato, or State Railways, whose Bologna-Ancona railway line was at risk (Segre, 1909). The findings of this enquiry will be dealt with in the next chapter but it should be noted that the report outlined a considerable risk of slope failure and recommended, among other things, the complete reforestation of that flank of Monte Montagnolo.

In 1957, the Ministry of Public Works (Consiglio Superiore LLPP) carried out a national study of the landslide hazard to roads which, when pub-

lished in 1963, specifically mentioned the Borghetto-Posatora area as a zone of high landslide risk. Nevertheless, in 1964 local politicians condemned ANAS, the national road-maintenance corporation, for hasty consolidation works at Borghetto on the Via Flaminia, claiming that ANAS had ignored the long-term risk to slope failure (cf. Colosimo, 1982a, p. 34, Fig. 1.28a).

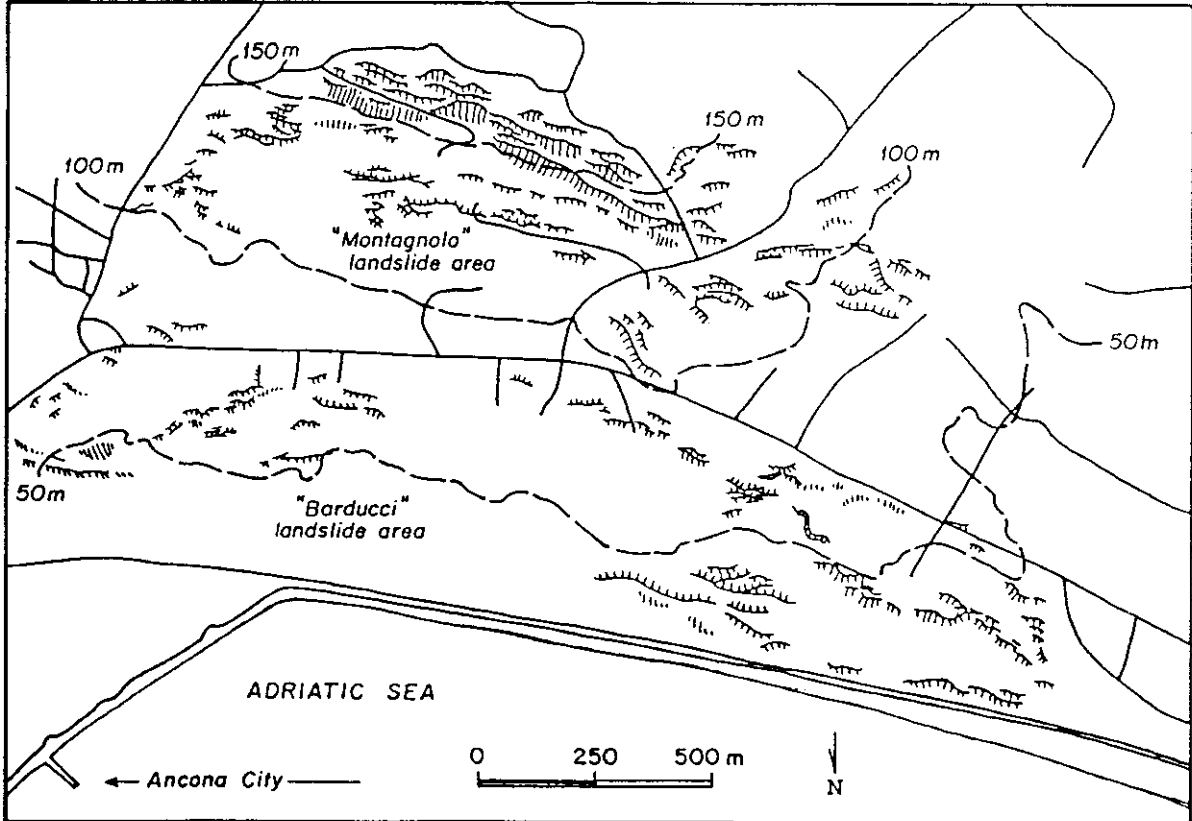
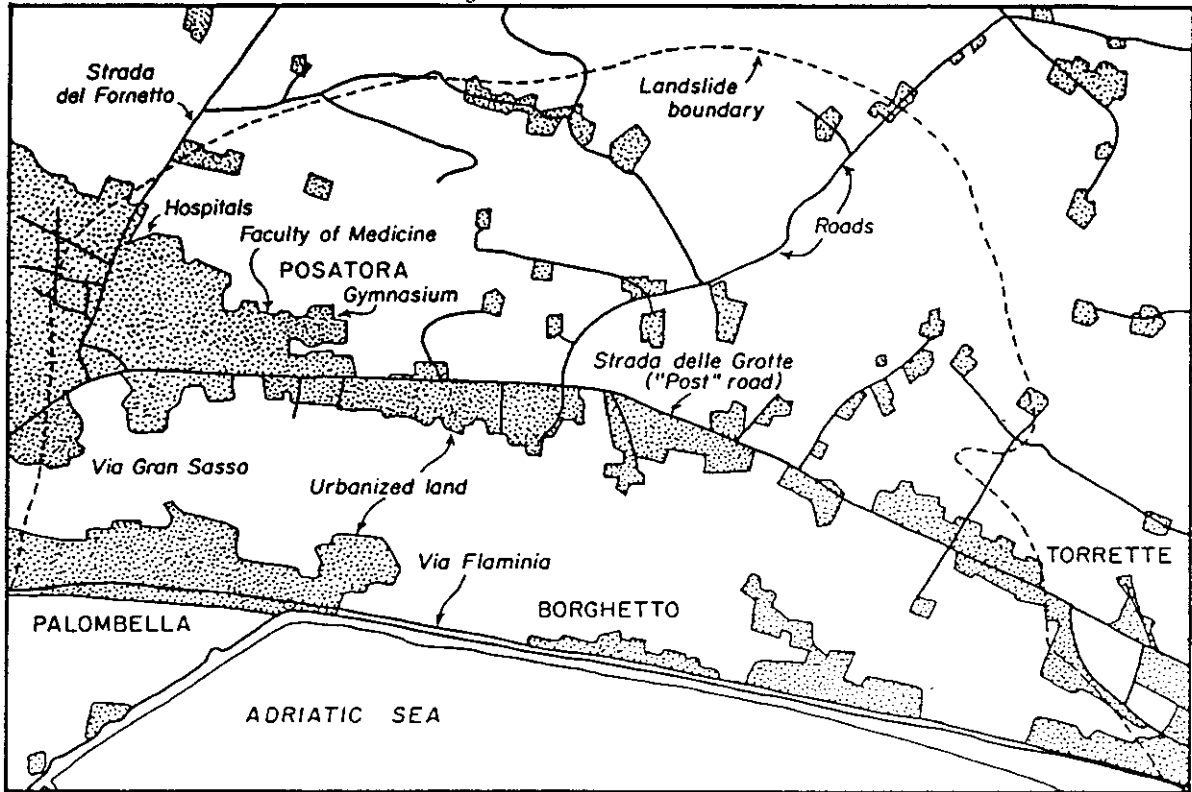
In the late 1960s, while the University Faculty of Medicine was being constructed at Posatora, the Ministry of Industry and Ancona Corps of Civil Engineers jointly commissioned a full-scale site investigation of the Montagnolo-Barducci slope, largely because substantial urbanization of the zone was planned. The report was completed in 1970, and it was adamant that in the interests of safety all further construction on the slope should be banned:

. . . the local morphological picture is quite clear, and leaves no doubt over the connection between current instability and the occurrence of recent and ancient landsliding, which conditioned and continues to condition the precarious state of this zone.

With respect to areas delimited as unstable [on a map compiled with the report], there are tracts where instability and fluvial dissection are particularly marked, such that further ground rupture will soon occur. The Barducci landslide area and steep slopes flanking the Posatora-Ancona coast road are examples of these more unstable areas. It is clear that there is full justification for the worries of the Corps of Engineers over the City Council's plan to develop beyond the western margins of the urban area, ever closer to the zones of major instability to the point of actually entering them (as is already occurring). These worries are even more justified given that we are dealing with a seismic zone [cf. Figure 3].

[Of the new urbanization] These structures have been built as if the terrain was of the most secure and tranquil kind: they have been banked up with supreme unconsciousness of the risk to the stability of these precarious slopes, using heavy walls and flinging the excavated material immediately downslope of the new roadways, in a chaotic accumulation of disturbed clays. There are already signs of a forthcoming landslide--nothing more or less.

Figure 3



1982 Landslide: Roads and Urbanized Land (upper);  
Surface Breaks of Slope (lower).

This document\*, which clearly had official status, was subsequently shelved and ignored by the local administration and Corps of Engineers, despite its emphatic tone of warning. Indeed, if press reports are correct, the Head of the Corps of Engineers even went so far as to build his personal villa in the middle of the Montagnolo slope.

A further study of the landslide zone was carried out in the early 1970s and submitted for publication to the Accademia Nazionale dei Lincei in 1974. At the same time a lawyer made a study of the legal aspects of slope instability at Posatora, at the behest of the Law Court, or Tribunal, of Ancona. On December 9, 1970, the Ancona City Council responded to the adverse findings of all these studies by commissioning a "super enquiry," which in hindsight might also be named a "counter-enquiry." The findings of this important document were submitted to the Comune and published in 1974 (Ceretti, 1974), and will be discussed in the next section of the present report. For the moment it is sufficient to note that the published article of the "super enquiry" concluded that much of the Montagnolo-Barducci slope had a factor of safety of at least 1.5, which is 50% greater than the limit threshold for failure. Such a conclusion was not fully borne out by the data, which suggested that a much lower safety factor was to be expected.

Further indications of landslide risk were given in a special geological monograph, with maps of structure and surface geology, carried out by a member of the Institute of Applied Geology at Ancona University, and published by the Comune of Ancona and the Regione Marche. Since the landslide, much has been made of this document, but it consists of little more than a literature review. It also contains hardly any specific information on

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\*The report is not referenced in the bibliography of this paper, as it was never published or made generally available.

slope instability at Montagnolo, yet it was obviously not intended as a direct predictive study in natural hazards, but as a summary of general geology.

### Political Responsibilities

Despite a certain element of disarray, it is clear that the overwhelming majority of the eleven studies of slope stability around Posatora warned in advance that the area was one of serious landslide hazard. Yet a structure plan was formulated in 1962 and revised in 1973 without taking account of that hazard. This curious state of affairs demands some explanation.

The Ancona City Council was dominated during several important years of this period by the Christian Democrat Party, who held the majority from 1969 until 1976. In 1976, power was transferred to a center-left coalition between the PCI, PSI, PRI and PSDI (respectively, the Communists, Socialists, Republicans and Social Democrats) with a Republican mayor as a leader. The Christian Democrats went into opposition, holding 18 seats, which was about the same number as the Communists had, and the coalition government persisted until 1983. Thus, if there is any political responsibility for past errors of judgement to attribute, it would be about equally divided between Christian Democrats and the center-left coalition, both of which enjoyed power during the critical years of decision making.

The local structure plan was designed by engineers, architects and urban planners, who claim that there was no attempt on the part of the geologists to forewarn them of the danger of urban expansion in the 1982 disaster zone. Nevertheless, it is clear that the Comune was planning a more detailed approach to slope morphology at the time of the catastrophe,

as it had ordered large-scale (1:10,000) contoured aerial photographs of the Posatora-Palombella zone (Regione Marche, 1980).

The immediate aftermath of the disaster saw a vigorous debate between members of the Comune and geologists with scientific interests in the area, as to who was responsible for forewarning of the landslide. The debate, dubbed "open war" by the newspapers, was heightened by legal considerations over the responsibility. Law No. 1684 of November 25, 1962, states that it is forbidden to urbanize actual or potential landslide terrain, and Article No. 426 of the Italian Penal Code prescribes a 5- to 12-year prison sentence for anyone found culpably responsible of putting others at risk by construction in a zone of serious landslide or avalanche hazard.

With these provisions in mind, the Magistrature of Ancona opened an official enquiry into the disaster on December 18, 1982, and the Mayor gave evidence on December 23. But the task of determining responsibility was not easy, as it was first necessary to prove the cause of the disaster (which geologists correctly said would take at least two years of detailed study to accomplish).

Despite mounting criticism, the Ancona administrators succeeded in maintaining a united front. During the first week after the disaster, the Mayor insisted that none of the studies of Montagnolo had demonstrated the scope or scale of the risk there. He was supported by the Chief Planner who argued that the geological enquiries had created a picture of the Barducci landslide as a localized and superficial phenomenon. He added that the studies carried out for the "super enquiry" had been reassuring (Corriere della Sera, December 18, 1982) and, furthermore, that the member of the Institute of Applied Geology commissioned by the Comune to study landslide

hazards in the Anconetan area had started too late, had focused attention on the Grotte al Passetto zone, not the Barducci landslide area, and had not indicated that Posatora and Palombella were substantially at risk\*.

The Proletarian Unity Party (PdUP), who had been quick to expose the inadequacies of other political groups, countered by reminding the administrators that the Ministry of Public Works had come out emphatically against urbanization of the Montagnolo slope as long ago as 1962. When asked by newspaper reporters to comment on the accusations made against him by the Chief Planner, the commissioned geologist replied:

The politicians committed the error of allowing construction to go ahead in a high risk zone, characterized by frequent landslides. All the local administrators knew perfectly well that the area is unstable, and in any case they had all the means of finding out (Corriere Adriatico, December 17, 1982).

This was an argument that could not easily be contested, but it did not entirely save the geologists from recrimination. The Chief Planner was quick to point out that, during his tenure as Chairman of the University of Ancona Sports Committee, the Head of the Department of Applied Geology at Ancona had arranged for the university gymnasium to be constructed in the landslide area next to the ill-fated Medical Faculty. In a letter to the Corriere Adriatico, (December 19, 1982), the Head replied that he was not then acting as geologist but merely as chairman of the sports committee. He added that the Institute of Applied Geology did not open until 1964, when the construction of the Faculty of Medicine had already begun. With regard to his own studies, the head geologist pointed out that he had recommended allowing development to take place on only 5% of the Montagnolo slope: on

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\*None of these statements agree with an explanation of the work given in a preface to the monograph.

45% it should have been discouraged and on 50% absolutely banned. Further weight was given to geologists' case by the President of the Marchigian Order of Geologists, who insisted in an interview that the Ancona landslide had not been foreseeable.

Politicians of the current opposition were also called upon to explain themselves by the newspaper reporters. A Christian Democrat Senator who had once been Mayor of Ancona, told Il Giornale d'Italia on December 16, 1982 that there had been unanimous acceptance among the Ancona Council when the 1962 and 1973 structure plans indicated development at Posatora and Palombella. Furthermore, none of the geologists investigating the area had voiced any opposition. However, the influential newspaper Corriere della Sera put forward the hypothesis on December 17 that the Christian Democrats had voted to urbanize the coastal zone to the west of Ancona as much of the land belonged to the Curia (Church Commissioners) who stood to gain in the resultant speculation. However, the paper also reported the Christian Democrat point of view that no one had pointed out the risks of such development, and the geologists were now speaking with hindsight (il senno di poi).

At the same time, the Communist daily L'Unità reported in an interview with the Vice-Mayor of Ancona and a PCI councillor, in which he stated that:

The problem of geological hazards is a national one. Here at Ancona, the Communists have tackled the problems of the city during the present emergency in an open manner, which everyone can observe. The city administration (Giunta Comunale) has been in existence since 1976, and the PCI has also greatly participated in the choices involved in implementing the structure plan of 1973. Only since then has there been recourse to any geological study [sic]. As a direct result, urbanization has been completely prohibited in the 'Barducci landslide' zone [sic]. If it hadn't been so, the toll in terms of economic loss and human lives would have been much greater.



It is worth noting with respect to this somewhat perplexing statement, that several apartment blocks were in the course of construction along the Ancona-Posatora "Post Road," and the unfinished buildings will now have to be demolished. However, it should also be noted that most construction on the Montagnolo slope took place over the period 1965-70; after the Ceretti-Dattilo study the only buildings to be constructed were seven apartment blocks, and three houses were modernized. Moreover, the PCI leader did admit (to Corriere della Sera) that it had been an error to allow construction to go ahead in the landslide zone. Having made its apologies, the PCI then turned its attention to a campaign to obtain full-scale disaster status for Ancona from the central government, so that the relief effort could be better financed, with more rapid consignment of allotted funds.

#### Geological Advice

The effect of the foregoing hiatus of conflicting and often incorrect assertions was to create a situation in which practically nobody succeeded in maintaining his credibility. A few words are necessary about the kind of information supplied to the public by the geologists. Press reporters were quick to seek comments from the director of the CNR Fenomeni Franosi (Landslide Phenomena) and Dinamica dei Versanti (Slope Dynamics) grant-assisted projects at Florence University. When asked what the causes of the Ancona landslide were, the director mentioned three: the load applied to the slope by constructing buildings, the lubricating effect of excessive rainfall, and the stress effects of earthquakes. Whilst it is probable that each of these factors contributed to the landslide, it is highly unlikely that any was a cause. A geologist from Rome University pointed out that the load effect of buildings on a 600 million ton body of earth was negligible; and heavy rain-

fall may cause pore water pressure to rise, resulting in failure of saturated ground (which is in many cases the most important cause of mass movement), but full lubrication will probably be achieved even in dry periods by pre-existing groundwater. Furthermore, the newspaper Il Tempo reported on December 17, 1982, that seismic activity in the Anconetan region on the night of the landslide had been minimal and, of course, the slope had not failed as a consequence of the 1972 earthquake (although it may have been significantly weakened).

The subject of groundwater also illustrated how perfectly valid geological information could be misunderstood by the press. An infra-red air photograph sortie was conducted at the beginning of 1983 and revealed that the body of the landslide was largely saturated with groundwater. This led even the more responsible newspapers, including the Turin daily La Stampa, to speculate that there was a subterranean lake under Monte Montagnolo, which had lubricated the base of the landslide. Geologists interviewed by the Turin newspapers described the Ancona slide as "a geological collapse without comparison in Europe" (even though a similar sized event had previously occurred at Fabrizia in Calabria), which is a generalization that can be contradicted by examples, including the prehistoric landslide at Flims in Switzerland, which was about three times as big as that at Ancona (Erismann, 1979).