



Session: RC48/RC47/RC23 Towards a Dialogue between Scientists, Civic Groups and Social Movements

Title: Scientists as activists: what role for scientific associations in the public sphere?

Authors: Ana Delicado (ICS University of Lisbon), Raquel Rego (SOCIUS – ISEG), Cristina Palma Conceição (CIES – IUL) and Inês Pereira (CIES – IUL)

Introduction

Scientific associations are a fairly neglected object both in the social studies of science and in the literature on social movements. Though it is often discussed the collaboration of individual researchers or research institutions with civic groups, there is little work done on the collective action of scientists.

This paper will examine the civic role of scientific associations, by drawing on the case of one particular controversy in Portugal, concerning nuclear energy. Even though there are no nuclear power plants in Portugal, their construction has been discussed recurrently in the past sixty years. And while environmental movements are currently leading the fight against nuclear energy, scientists, either isolated or in more or less formalised groups, have also played a significant role in the debate.

This paper is based on a yet exploratory analysis, sustained mainly on documentary evidence (books, newspaper articles, but also some exploratory interviews) that should later on be complemented by interviews with the main actors in the events described below. It is part of an ongoing research project on scientific associations funded by the Portuguese Foundation for Science and Technology.

Scientists, social movements and nuclear energy

In environmental controversies, scientists often find themselves in both sides of the barricades. On the one hand, they are often called upon by Governments and business companies to provide scientific and technical advice and support (or just justification) for actions and measures that have an environmental impact. On the other hand, scientists frequently side with environmental organisations or lay movements that oppose such actions or measures, also providing them with scientific arguments to support their position.

The old ideal of the appeal to facts and their interpretation by accredited experts has been eroded by the increasingly obvious limitations of experts and expert knowledge in resolving issues of public controversy. There is now widespread public perception that experts can and do disagree, that they are not infallible by virtue of their specialist access to some rigorous methodology that can guarantee their 'objectivity', and that their purportedly disinterested advice may be influenced by professional, economic, or political considerations. (Martin and Richards 1995: 507)

Scientific associations, like other non-governmental organisations, often act as mediators between social groups and society and the Government, as means to aggregate interests, channel collective action, exert pressure, pursue collective goals. And although the majority, chiefly of a disciplinary nature, are mainly concerned with the internal affairs of the scientific field, namely the regulation of scientific practice, the dissemination of scientific knowledge among peers, the aggregation and representation of professional interests (which includes lobbying public bodies), these associations often engage in social intervention (policy assessments and advice, actions and initiatives aimed at society at large, cooperation with NGOs). Additionally, new kinds of scientific associations have emerged, specifically devoted to particular areas such as environment, energy, development, peace, health, education, public understanding of science.

Nuclear issues, both nuclear arms and nuclear energy, have been at the heart of some scientific organisations. The Pugwash movement was founded in 1957 as a result of the Russell-Einstein Manifesto against nuclear war. It was an advocacy group formed by scientists that "addressed governments on subjects like biological warfare, strategic arms limitation, and misuse of civilian nuclear technology" (Greenaway 2006: 178). Included in this movement is the Federation of German Scientists, created in 1959, as a result of the Declaration of Gottingen, in which nuclear scientists expressed their position against nuclear armament and vowed not to participate in military research. The Union of Concerned Scientists was created in 1969 in the US as a public interest organisation and one of its first battles concerned the safety of nuclear reactors (Dawney 1988; Rucht 1997). The International Council of Scientific Unions created in the late sixties its Scientific Committee on Problems of the Environment (SCOPE), which in turn originated a Committee for the Assessment of the Environmental Consequences of Nuclear War in 1983, whose report coined the phrase "nuclear winter" and was instrumental in the UN resolution concerning the reduction of nuclear arms (Greenaway 2006: 178).

Introducing nuclear energy in Portugal

The political will to build a nuclear power plant in Portugal started manifesting itself in the middle of the 20th century, still under an authoritarian regime. The main argument in the 50s and 60s favouring nuclear energy in Portugal was the existence of uranium mines (whose product could be used as nuclear fuel) and an expectation of growth of electricity consumption that could not be met with existing hydroelectric resources.

Although nuclear research started in the University of Lisbon in the 30s, it was only in the mid-50s that the Government created both the JEN (Nuclear Energy Agency) and the Nuclear Energy Studies Commission in order to promote the “stable development of the national nuclear capacity” (Jorge and Costa 2001: 39), aiming both at research and application, namely the training of personnel for future nuclear facilities. As a result, hundreds of scholarships were awarded to Portuguese students in nuclear physics, including for PhD studies abroad. JEN’s main attributions were the management of the uranium mines, but at the end of the decade a laboratory affiliated to JEN was created to carry out nuclear research, the Physics and Nuclear Engineering Laboratory (LFEN), heavily funded by bilateral agreements with the US under the “Atoms for Peace” Programme. The Portuguese Research Reactor was commissioned in 1959 and started functioning in 1961 (Jorge and Costa 2001). However, according to Jorge and Costa (2001), LFEN always showed little interest in being involved in industrial applications of nuclear energy, concentrating conversely on research and training.

In the private sector, a short-lived company, the National Company of Nuclear Industry (1958-1964), produced several technical studies and reports on the installation of a nuclear power plant in Portugal. Counting among its shareholders several electricity companies, industrial companies, a shipping company and a bank, the company’s aim was to become “a qualified go-between in a future programme for building nuclear power plants in Portugal” (Jorge and Costa 2001: 72), but attempts to liaise with LFEN were thwarted.

In the end of the following decade (late 60s and early 70s), the Government creates a General Directorate for Industrial Nuclear Fuel and Reactors within JEN, in charge of licensing and supervising future nuclear power plants.

The revolution in 1974 and the ensuing political instability pushed back government plans for building the nuclear power plant but only for a few years. The international context, mainly the oil crisis in the early 70s, only made it more urgent to assess this option. The electricity companies, later merged into a single company (EDP), were already compiling technical reports in support of locating the first nuclear power plant in Ferrel, a small village near the coast 80 km north of Lisbon. In November 1975 the nuclear option is discussed in a seminar on Energy Policy, and the first critical voices are raised.

But it is in March 1976 that the government issues legislation indicating that licensing the nuclear power plant is imminent and it is announced that the chosen location is Ferrel (and some preparatory building work begins), generating the public response described below. Faced with public outcry, at the end of the year the government commissions a White Book on the Nuclear Programme¹, an extensive technical report prepared by pro-nuclear scientists and engineers that gathers contributions from several organisations. The White Book is finished in the following year and sent to the Prime-Minister, but only made public in 1980 and with a very limited diffusion (Pereira et al 2010).

¹ In Portugal there is a lack of institutionalised forms of scientific advice for public administration and private companies (Gonçalves 2002), which tends to leave in the hands of actors the decision of when and how (which scientific disciplines and institutions to appoint) request the assessment of experts.

Discussions continue throughout the final half of the decade and the issue is debated a few times in parliament, where the fierce opposition of some parties is expressed (Pereira et al 2010) but no decisions are made. Paradoxically, in the same period JEN was discontinued and LFEN integrated in a large scale State Laboratory (LNETI – National Laboratory of Industrial Engineering and Technology) concentrating all the laboratories that provided support to industrial sectors (only in 1994 would LFEN regain its autonomy as ITN – Nuclear Technology Laboratory). Within the Ministry of Industry is created the Office of Nuclear Safety and Protection, whose mission is to control the safety of nuclear reactors and power plants, assessing and monitor its functioning. And even though the public reaction ought to have played an important role in overruling the nuclear option, the final blow to the Ferrel project was a report from this Office, assessing the seismological risk of the area that demonstrated that the proposed location did not meet the safety thresholds recommended by the International Agency for Atomic Energy.

Ferrel: the first environmental social movement

Decades of an authoritarian regime had given little margin in Portugal both for the creation of environmental organisations and for social movements in general. However, right after the 1974 Revolution the climate was ripe for collective action. Hundreds of local associations sprung up, such as residents commissions (Pinto 2008),

The revolutionary period (1974–75) witnessed a range of fascinating experiences of active citizenship and of attempting to bring together the two traditions of representative and participatory democracy. As the process unfolded (...) a plethora of social movements and citizen initiatives gave rise to the invention of new forms of participatory democracy. (Santos et al 2004: 11)

Environmental NGOs (ENGOS) also only started to be formalised after 1974, but their number grew substantially over the following decades (Soromenho-Marques 2005; Figueiredo et al 2001; Rodrigues 1996; Kousis et al 2008). Figueiredo et al (2001) also traced the surge in grassroots environmental protests between 1974 and 1994, noticing that right after the Revolution there was a substantial number of cases in which local populations rose against an environmental threat followed by a period of less contestation in the 80s, only to rise again in the 90s. These protests were related more frequently to waste disposal and treatment, followed by construction and infra-structures, manufacturing activities, wildlife areas and only in 9 per cent of the cases with energy facilities.

Ferrel is widely considered as the first grassroots environmental movement, often celebrated as a founding moment of environmentalism in Portugal. Poetical accounts of what happened in the morning of March 15 1976, when the local population marched to the construction site, abound: “in response to the relentless chime of their church bells, the inhabitants of Ferrel went out into the street, stopped all the works, closed the ditches that had been opened and warned that if the works restarted they would come back to destroy whatever had been done”

(APEAT 1981). An local organisation is formed, CALCAN – Support Commission to the Struggle Against the Nuclear Threat, that sends a protest to the Prime-Minister, signed by local associations, local newspapers, inhabitants' committees, local business, trade unions and schools. Over the following months several ENGOs and environmental activists (Afonso Cautela and José Carlos Marques are leading figures) show their support, local meetings are promoted with the participation of scientists (see below), and the protest continued. In February 1977, the environmental group "Living is Needed" launched a national appeal under the heading "We are all inhabitants of Ferrel", against the pro-nuclear policy of the government. A few months later, in June a forum was held in a nearby city, Caldas da Rainha, from which emerged two statements, "Portuguese Nuclear Programme Moratorium" and "People's Creative Intervention in Defence of a Non Depleted Environment". A folk singer, Fausto, created a song in which the nuclear power plant was mentioned.

In January 1978 the last major event of this protest takes place. A festival titled "For Life and Against Nuclear" is held at Caldas da Rainha, bringing together close to 3,000 participants, among which several scientists and artists, as well as environmental activists and local population. Debates, shows and other activities are promoted, alongside a peaceful demonstration that again reaches the location in which the nuclear facility was to be built.

In the late 70s other demonstrations and actions are organised against the nuclear option in other parts of the country, also strongly influenced by the "anti-nuclear wave that swept across advanced industrial democratic nations by the late 1970s" (Gil Nave 2001: 374; see also Rucht 1997, Touraine et al 1980), but the movement fizzles out when the plans for the nuclear power plant are abandoned. Many of the ENGOs in these events involved have long ceased to exist but others, much stronger, have taken their place.

Ferrel has remained for many the blueprint for other grassroots environmental movements. From the construction of a thermal power plant in Vila Nova de Anhã (Kousis 2004) to the co-incineration of industrial waste (Matias 2004; Gonçalves and Delicado 2009), from mobile phone masts to toxic discharges in watercourses, many technological hazards have been the target of public protest in Portugal in the past decades. In these cases, the public has come together in impromptu (or sometimes formalised) groups, has gathered scientific information (often if not always from foreign sources), has brandished social and technical arguments with more powerful opponents, have deployed all tools of political protest and even resorted to the terribly slow and expensive Portuguese judicial system to defend their health and safety.

The role of scientists

Controversies around nuclear energy have a strong scientific nature and it is hardly surprising that scientists became heavily involved in the debate, both internationally² and in Portugal.

² In 1975, 4,000 French scientists and engineers signed a petition questioning nuclear power, although A. Touraine and his team discovered that some of the activists were more concerned about the

On the pro-nuclear side, the government stance was supported by several technical reports (including the White Paper) produced by engineers and researchers working either for the electricity company EDP or for JEN/LFEN (on the lack of public trust in scientific data provided by private companies, see Covello and Peters 1996, Wynne 2002). They intervened in the public debate by making presentations at seminars organised by EDP (there was one in 1976 aimed exclusively at journalists), by giving interviews and writing opinion articles on newspapers and by publishing books. One of the leading figures in this group was Jaime Oliveira, coordinator of the team in charge of writing up the White Book, a PhD in Nuclear Physics and researcher at LFEN. He wrote several books aimed at the general public (Oliveira 1977; Oliveira and Martinho 1977) with the purpose of

contributing to the public debate of such an important (and exciting issue) such as the peaceful use of nuclear energy in Portugal (...) a global vision that will make easier [for the reader], I hope, to appreciate its relative importance. To emotional and so often ill-founded relations they rise, I seek to counterpoint the serenity that that stems from the scrupulous respect for scientific objectivity (Oliveira 1977: 6).

The main arguments put forward by scientists defending the nuclear option in the 70s were that it was the sole solution for solving the energy crisis and sustaining the predictable rise in electricity consumption, that uranium mining resources could be put to use and that environmental risks were manageable: the probability of risks was very low, safety standards were high, other facilities of energy production were more polluting and hazardous.

Other scientists took the anti-nuclear stance and sided with the local populations. One of the most vocal was Delgado Domingos, professor at the most prestigious engineering school in the country (IST) and an expert on energy, who started intervening in the early debates in 1975 and is, to this day, a permanent fixture in all the debates on nuclear energy in Portugal. He published also books on the subject (Domingos 1978), but it is his intervention in the Ferrel case that is more outstanding. He was invited to address the local population at a public session, right after the “invasion” of the construction site:

It was in a theatre, there were a lot of people there, I was very anguished, but I explained them some fundamental data, the issue of the currents. There is sheer personal credibility, but people didn't know me, I was sensitive to that. They were fishermen, so I remembered the example of accident in which they drowned, so I said “you don't need experts, you know the currents, you know if someone drowns here where you can pick him up”. It was immediate harmony, they raised me in their shoulders, I was very embarrassed. (interview to Delgado Domingos, 2004)

He returned to Ferrel subsequently, to the Festival in 1978 and continued to speak publicly against the nuclear power plant.

Other scientists were also taking individual stances against the nuclear options, by writing opinion articles in newspapers and intervening in seminars and events, as well as the 1978 Festival in Caldas da Rainha. These researchers came from a wide array of disciplines (nuclear

bureaucratic organisation of their laboratories and were “profoundly sceptical of expertise” (Weart 1988: 352; see also Touraine et al 1980)

physics, but also biology, engineering, chemistry) and mainly from the university. Many came together in what can be considered a “social movement of scientists” against the nuclear option. In June 1997 a group of 110 scientists and technicians (many from the electricity company) signed a Manifesto on Energy Policy, asking for a national debate on nuclear energy. The main claim was there was insufficient scientific evidence to support the nuclear option and that such a major decision had to be preceded by a wide public debate.

Precisely a year later, this group (which by then had grown to 200 members) formed a “Commission for Promoting the National Debate on the Nuclear Option” and held a press conference, asking for the White Paper to be made public and forming several work groups for studying issues such as safety, the fuel cycle, economics, the participation of national industries, energy alternatives and the biological effects of radiations. The Commission is led by two university professors from the engineering school IST, both from nuclear physics. Their main demand continues to be an independent scientific evaluation of nuclear energy in Portugal, but put forward several arguments against it: the economic competitiveness of nuclear energy on the long run is doubtful, ensuring safety standards will raise costs enormously, there are no environmental impact assessments done in Ferrel (concerning maritime currents, atmospheric conditions, ecology, fish resources, thermal and radioactive pollution).

In the following year, representatives from this Commission wrote an opinion article in a national newspaper in which they reaffirmed their position against a nuclear power plant, by arguing that accidents are a serious risk with a high probability and the lack of technicians in Portugal raises that risk, that environmental contamination is a hazard and there is still no solution for nuclear waste, that hydrological resources could be better used and that uranium imports would deepen the dependency of Portugal from abroad.

Another group of scientists, who had been meeting regularly in energy seminars, published a book in November 1978 on this issue (Moura et al 1978). The authors come from different backgrounds (economics, physicists, engineers) and work at different institutions (LFEN, IST, University of Lisbon, EDP) and the contents of the book are mainly technical. Its purpose is stated in the introduction:

[the book] stems from the conscience that technicians and scientists have a civic mission of public enlightenment that must be fulfilled within their areas of expertise and to the best of their abilities (...) the authors aim to enlighten the reader about the problems of real importance that the use of nuclear energy raises in our country, in order for him to distinguish what is crucial from what is not and take a substantiated position (...) the debate about the nuclear power plant is an exemplary case of the participation that citizens could and should have in the discussion of undertakings and economic and social policy options that are determinant for the future of a region or country. The authors hope that this book contributes to helping the debate become more useful and fruitful (Moura et al 1978: 16).

Nevertheless, it's the conclusion of the book that points towards the standpoint of the authors: they conclude that “on a national perspective, there is no technical nor economical

basis for opting for a nuclear power plant” (Moura et al 1978: 276), since it would not replace conventional energy sources, it would increase foreign dependency and there would be great difficulties in ensuring safety conditions in Portugal. There is also an undertone of denouncing the political and corporate interests that permeate the nuclear option.

Thus, in the nuclear controversy of the 70s, scientists presented themselves as “enablers” of public participation, as a source of “enlightenment” to the general public, providing accurate and unbiased information to help them decide which side to take in the discussion. It cannot be but a reflection of the post-revolutionary climate this emphasis on public participation in major policy decisions. And though individual opinions and statements from scientists are still dominant in the debate, the scientific community also showed some ability to act collectively, which is fairly unusual.

Gil Nave (2001) considers that in this case “what was at stake was the legitimacy of decision-making processes centred on the mechanisms of representative democracy and administrative technocracy” and explains the success of the anti-nuclear stance by a “weakly organised, though convincing, discourse-oriented action that strongly mobilised public opinion” that “took advantage of cleavages over the issue among state and governmental actors in one hand and parties on the other”, but also on the role played by “other powerful and highly influential actors (...) an active group of university experts on energy (...) influential leaders of conventional parties and of several governments of the period, and an elite of intellectuals and media opinion-makers” (2001: 347-348).

The issue reemerges in the first decade of the new century

Throughout the 80s and 90s the nuclear debate abated considerably. Although the issue was periodically raised whenever the national energy plans were under discussion or there was some problem with the Spanish nuclear power plants, it was only in the first decade of the 21st century that the discussion was reignited. In mid 2005 a group of businessmen started lobbying in favour of nuclear energy. They announced the intention of building a nuclear power plant and the creation of a company, Nuclear Energy of Portugal, in a press conference and gradually gained the support of several semi-public companies, such as EDP, REN (electricity grid company), some former ministers and junior ministers, the Bank of Portugal Governor. However, the government took no official position over the issue. Over the next few years, numerous conferences were held for debating this issue, bringing together foreign experts (from countries with nuclear energy), business representatives, pro and against scientists and ENGO representatives. A book was published in 2006 (Rodrigues and Azevedo 2006), gathering contributions both pro and against the nuclear option, again aiming to foster public debate. The issue was debated in parliament and in 2010 a group of business representatives, engineers and scientists signed a manifesto for a new energy policy that criticised the option for renewable energies and claimed for the need to reassess other options, implicitly nuclear energy. The socialist government in power rejected these demands

and renewed their commitment to invest in solar and wind power, as well as to build more dams.

In this period there have been no grassroots movements against the nuclear option, mainly due to the fact that no locations for a power plant were discussed. However, in 2006, the 30th anniversary of the Ferrel movement was celebrated with a demonstration that brought together many of the scientists, journalists, environmentalists and local authorities involved in the case. Public opinion surveys had by now become common and a few were made concerning the nuclear option. In 2006, opinions were almost equally divided: 38 per cent against, 37 per cent in favour and 24 per cent had no opinion. A Eurobarometer survey in the same year (EC 2007) showed different figures: 12 per cent in favour of nuclear energy and 39 per cent against. More recently, another Eurobarometer (EC 2010) showed that the Portuguese had low levels of agreement with the advantages of nuclear energy and that for the majority the risks outweigh the benefits but also that misinformation in Portugal is rife: 53 per cent of respondents seemed to ignore that there are no nuclear power plants in Portugal.

What has changed substantially in these three decades is the role of ENGOs in the debate. These organizations have become stronger (Soromenho Marques 2004; Figueiredo et al 2001; Gil Nave 2001), with thousands of members; they receive public subsidies and are represented in advisory bodies (for instance, at CNADS – National Council for Environment and Sustainable Development). Many are headed by academics and develop a wide array of activities, including at times scientific research. They have led the campaign against nuclear energy, issuing statements, organising press conferences and taking part in public debates. In 2006, a “Platform No to the Nuclear Option in Portugal” was formed, bringing together several ENGOs, citizens and other organisations.

Several scientists also manifested publicly their opposition to the nuclear option. Delgado Domingos remains one of the more sought after opponents to nuclear energy, invited to almost all seminars on this issue, but others have also followed suit, such as Manuel Collares Pereira (INETI), Eduardo Oliveira Fernandes (University of Porto), Jose Peças Lopes (University of Porto), António Sá da Costa (civil engineer, president of the Association of Renewable Energies), Frederico Carvalho (ITN), Teresa Peña (IST). Other scientists have spoken in favour of the nuclear option, such as Carlos Varandas (head of the Research Centre on Nuclear Fusion, professor at IST), José Carvalho Soares (former head of ITN, professor at the University of Lisbon), José Luís Pinto de Sá (professor at IST), José Marques (ITN).

There is no clear division between scientific disciplines or institutions in this debate. The arguments remain fairly the same as in the 70s, but the against-nuclear camp has included the important role of renewable energies in Portugal in their argumentation and the pro-nuclear camp has profited from the problem of climate change to argue in favour of nuclear energy.

Again in the 2000s, it is the collective action of scientists that is more interesting, but this time it took the opposite direction than in the 70s. In 2009 a group of scientists, most of them physicists and members of the Portuguese Physics Society (which had held a round table in 2008 and issued an official statement on the issue), decided to form the ADN – Association for the Dissemination of Nuclear Energy. Some of the scientists involved had taken part in the 70s movement and had changed sides (João Caraça), others were new to the debate: Augusto

Barroso (University of Lisbon), Carlos Fiolhais (University of Coimbra), Manuel Sobrinho Simões (University of Porto), Ana Arriaga (University of Lisbon), Ana Eiró (University of Lisbon), Clemente Pedro Nunes (IST), Fernando Carvalho Rodrigues (NATO), Fernando Parente (New University of Lisbon), José Dias Urbano (University of Coimbra), José Marques (ITN), José Sucena Paiva (IST), Paulo Santos (New University of Lisbon). A few came from other disciplines, such as medicine and electronics engineering. ADN was meant to be “a platform for debate and accurate information on nuclear energy” and was created to “increase the information and training on nuclear energy (...) [and] widen the debate to society in general”, but the manifesto clearly defended the investment in nuclear energy and finished with the sentence: “all energy we consume on Earth comes from the sun and the energy from the sun is nuclear”. The manifesto sustained its stance also in the 2007 position paper of the European Physical Society in support of nuclear energy but that defended the need “to inform the general public on how to assess relative risks rationally”.

However, this association was never officially created and the issue of nuclear energy seems to have died down again in Portugal.

Final remarks

Nuclear energy is an exceptionally contentious techno-scientific issue and has been so for almost a hundred years. It is probably one of the most obvious subjects for examining the interplay between scientists and social movements. But it also seems a privileged standpoint for analysing the collective action of scientists themselves.

From this brief description of the Portuguese case, a few aspects should be highlighted. First, how the re-emergence of the debate 30 years after the initial outbreak brings back many of the same actors (but that in some cases have changed sides) and arguments to justify pro and against positions. Second, how unlike other risk cases, the nuclear controversy motivated scientists not just to issue statements and advice but also to come together and act as a group, even, in more recent years, by forming an association. And thirdly, how the role played by scientists cannot be seen in isolation either from the internal workings of the scientific field (the competition between scientific disciplines, the rivalries between institutions) or from the actions of other social actors (NGO, business companies, the Government).

However, this is just an exploratory analysis, which needs to be further developed, framed within a sounder theoretical conceptualisation and complemented with more in-depth work, such as interviews to the intervening scientists, a more thorough examination of legislation and official documents, a more detailed approach to the role of the associations involved.

References

APEAT - Associação Portuguesa de Ecologia Amigos da Terra (1987), *Antes... durante... e depois de Chernobyl : o nuclear no mundo e em Portugal*, Lisboa : A.P.E.

Cautela, Afonso [et al.]. (1977), *O suicídio nuclear português*, Lisboa : Socicultur.

Covello, Vincent T. and Peters, Richard (1996), “The determinants of trust and credibility in environmental risk communication: an empirical study”, in *Scientific uncertainty and its influence on the public communication process*, ed. idem, SUBLET, Virginia H. e TINKER, Tim L., Dordrecht, Kluwer Academic Publishers, p. 35;

Domingos, J. Delgado (1978), *Inteligência ou subserviência nacional?*, Porto: Afrontamento.

Downey, Gary L. (1988), “Reproducing Cultural Identity in Negotiating Nuclear Power: The Union of Concerned Scientists and Emergency Core Cooling”, *Social Studies of Science*, Vol. 18, No. 2, pp. 231-264

EC (2007), *Special Eurobarometer 66.2 Europeans and nuclear safety*, Brussels: European Commission

EC (2010), *Special Eurobarometer 72.2 Europeans and nuclear safety*, Brussels: European Commission

Figueiredo E., Fidélis T., Rosa Pires A. (2001) “Grassroots Environmental Action in Portugal (1974-1994)”, in *Environmental Policies in Southern Europe, actors, institutions and discourses in a europeanizing society*, ed. Eder, K. e Kousis, M.. Kluwer Academic Publishers. Dordrecht. 129-221

Gil Nave, Joaquim (2001), “Non-governmental groups and the state”, in *Environmental Policies in Southern Europe, actors, institutions and discourses in a europeanizing society*, ed. Eder, K. e Kousis, M.. Kluwer Academic Publishers. Dordrecht, 343-364

Gonçalves, M. E. (2002) “Implementation of EIA directives in Portugal: How changes in civic culture are challenging political and administrative practice,” *Environmental Impact Assessment Review* 22: 249–269.

Gonçalves, Maria Eduarda and Delicado, Ana (2009), “Science and the politics of risk in contemporary Portugal”, *Science and Public Policy*, 36(3), 229-239

Greenaway, Frank (1996), *Science International: a history of the International Council of Scientific Unions*. Cambridge: Cambridge University Press.

Jorge, H.Machado and Costa, C.J. (2001), *O Reactor Português de Investigação no panorama científico e tecnológico nacional, 1959-1999*, Lisboa: ITN e Sociedade Portuguesa de Física.

Kousis, Maria (2004), “Marine and coastal issues in local environmental conflict: Greece, Spain and Portugal”, in *Contesting the foreshore: tourism, society and politics on the coast*, ed. Jeremy Boissevain and Tom Selwyn, Amsterdam: Amsterdam University Press, 205-231

Matias, Marisa (2004) 'Don't Treat us Like Dirt': The Fight Against the Co-incineration of Dangerous Industrial Waste in the Outskirts of Coimbra', *South European Society and Politics*, 9: 2, 132 — 158

Moura, Domingos [et al.]. (1978), *O que é a energia nuclear: oportunidade em Portugal*, Lisboa: Moraes Editores.

Oliveira, Jaime da Costa (2002), *A energia nuclear em Portugal: uma esquina da história*, Santarém: O Mirante.

Oliveira, Jaime da Costa (1977), *A energia nuclear: bases para uma opção*, Lisboa: Sá da Costa, 1977

Oliveira, Jaime Manuel da Costa e Martinho, Eduardo J. C (1978), *Energia nuclear: origem e aplicações*, Lisboa : Junta de Energia Nuclear.

Pereira, Tiago Santos; Rodrigues, António Farinhas; Carvalho, António; Nunes, João Arriscado (2010, forthcoming), "Parlamento e Conhecimento Científico: Dupla delegação?", in *Democracia, Deliberação e Participação Pública*, ed. José Manuel Leite Viegas, Lisboa: Mundos Sociais

Pinto, Pedro Ramos (2008). "Urban Social Movements And The Transition To Democracy In Portugal, 1974–1976". *The Historical Journal*, 51 , 1025-1046

Rodrigues, Jorge Nascimento and Azevedo, Virgílio (2006), *Nuclear: o debate sobre o novo modelo energético em Portugal*, Famalicão: Centro Atlântico.

Rucht, Dieter (1997), "The impact of anti-nuclear power movements in international comparison", in *Resistance to new technology*, ed. M. Bauer, Cambridge, Cambridge University Press, 277-292

Santos, Boaventura de Sousa and Nunes, João Arriscado (2004) 'Introduction: Democracy, Participation and Grassroots Movements in Contemporary Portugal', *South European Society and Politics*, 9: 2, 1 — 15

Soromenho-Marques, Viriato (2003) "O Associativismo ambiental em Portugal: Potencialidades e limites", in *Novas Formas de Mobilização Popular*, ed. José Rebelo, Lisboa: Campo das Letras, 2003, 197-207.

Touraine, Alain, Hegedus, Z., Dubet, F. And Wieviorka (1980), *La prophétie anti-nucleaire*, Paris: Seuil

Weart, Spencer R. (1988), *Nuclear fear: a history of images*, Harvard: Harvard University Press

Wynne, Brian (2002), "Risk and environment as legitimacy discourses of technology: reflexivity inside out?", *Current Sociology*, 50 (3), 459-477.