

Poverty, human development, environmental and health risks: the role of precaution and cautionary policies

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Summary. First of all a definition is given of “poverty” and “precaution”. A short, by no means comprehensive, presentation of some especially relevant recent publications on both topics is included, with a view to offering also readers who are not familiar with these issues a broad overview of the specialised literature available. This is followed by a description of the solidarity concept, following various philosophical, cultural and religious trends, analysing their relationship with precaution. An attempt is then made to show how solidarity and precaution could help counteract poverty, the risks for the environment and health, with the ensuing social and health damage. Reasons are outlined which support the adoption of the precaution principle in economics, as well as some arguments which could be put forward to oppose these views. The final remarks are a reply to such criticisms with a view to showing how precaution could be an effective economic tool, as well as a way to tackle those health-related and environmental problems that are also associated with poverty.

Key words: poverty, human development, precaution, ethics, risk, environment, health.

Riassunto (*Povertà, sviluppo umano, rischi ambientali e sanitari: il ruolo del principio e delle politiche cautelative di precauzione*). Inizialmente si fornisce una definizione di “povertà” e “precauzione”. Si presentano brevemente, senza pretesa di completezza, alcuni volumi recenti particolarmente significativi su entrambi gli argomenti, al fine di offrire anche al lettore non assiduo a questi temi una panoramica esemplificativa delle varie voci presenti nella letteratura specializzata. Si discute poi la nozione di solidarietà secondo varie impostazioni filosofiche, culturali e religiose; se ne analizzano le relazioni con la precauzione. Successivamente si cerca di mostrare come solidarietà e precauzione possano contribuire a contrastare la povertà, i rischi per l’ambiente e la salute, i danni sociali e sanitari che ne derivano. Si descrivono motivi a favore dell’adozione del principio di precauzione in economia, nonché critiche che possono essere mosse a tali motivi. Si offrono poi una serie di considerazioni per replicare a tali critiche, cercando di argomentare come la precauzione possa essere uno strumento efficace in economia e nella lotta ai problemi sanitari ed ambientali associati anche alla povertà.

Parole chiave: povertà, sviluppo umano, precauzione, etica, rischio, ambiente, salute.

POVERTY AND HUMAN DEVELOPMENT

The study of relationships between poverty and development: a historic overview

Poverty is an ever-present phenomenon in the history of mankind which knows no geographical boundaries [1]. In the 19th century, at a time of tumultuous industrial development, the first wide-ranging surveys were carried out on the relationship between social and health conditions. In 1840, for example, Louis Villermé published the *Tableau de l'état physique et moral des ouvriers dans les fabriques de coton, de laine et de soie*, highlighting the relationship between poverty and health conditions. The English *Sanitary Report* of 1842, mostly by Sir Edwin Chadwick, paved the way for the “Public Health Act” in 1848, inaugurating the modern approach to public health [2].

Poverty is one of the major issues studied by modern sociology: modern North-American sociology was born at the beginning of the 20th century, thanks to various authors who studied the relationship between poverty, marginalisation and health. Mention should be made in particular of Louis Wirth, author of *The Ghetto* [3]. A substantial part of the literature on the topic at the time focused on indolence as the main cause of poverty. This idea is, indeed, recurring: Thomas Malthus firmly expressed it in *An essay on the principle of population* (1798), where he categorically stated that those who are poor and suffer from deprivation are merely reaping the products of their non-virtuous behaviour [4].

During the 20th century, also with the help of other disciplines, such as anthropology, the relationships

between poverty, culture and social ethics have been analysed: in 1961 the anthropologist Oscar Lewis, in his text *The children of Sanchez. Autobiography of a Mexican family* [5], coined the expression “culture of poverty”, which is still being debated today. The “culture of poverty” theory was then criticised, especially in the 1970s [6]: a number of sociologists and anthropologists pointed out that poverty is based on economic and social factors; referring to a “culture of poverty” means enhancing marginalisation by encouraging the trend to holding the poor themselves responsible for their situation. The debate continued in the 1980s, especially with reference to the “welfare state” model. In the meantime, however, the features of poverty changed. In the post-war period, until the Seventies, the “poor” were mainly farmers and unskilled workers; from the 1980s the number of “new poor” started to grow, which included unemployed, homeless people and immigrants. They have been described in a large number of studies, with the help of various disciplines (demography, economics, sociology), which highlight the different sides of the question: the word “poverty” itself tends to be replaced with more specific expressions to underline its various facets (exclusion, instability, and others) [7].

In the course of this historic development, scholars have also designed detailed methods to define and “measure” poverty. In studies published between the end of the 19th and the beginning of the 20th century, poverty was described empirically, without focusing on scientific quantification: the descriptions referred to lifestyles (clothing, diet, work) to indicate the approximate level of poverty. Today poverty is described in a much more complex way and the various definitions often refer also to distribution justice, moral philosophy, political responsibility aspects. A distinction is therefore made between various kinds of poverty which are often intertwined: economic poverty, human poverty, multi-dimensional poverty, to mention but a few [8].

By economic poverty we mean insufficient resources to support the fulfilment of primary needs. It can be described in absolute or relative terms. The reference units can be the individual, the family, the community. Generally speaking, studies refer to poverty “thresholds” based on various parameters. The most widely used is probably the Organisation for Economic Co-operation and Development (OECD) scale. There are, however, also “subjective” scales such as the minimum income question (MIQ), whereby respondents are asked to express an opinion about their possibility of dealing with specific financial needs. The analyses of economic poverty often refer to concepts such as “vulnerability”, “chronic poverty”, “transient poverty”, and others.

The United Nations Development Programme (UNDP) defines human poverty as “the impoverishment in multiple dimensions-deprivations in a long and healthy life, in knowledge, in a decent standard of living, in participation” [9]. The Human Poverty Index (HPI) and other indices provide a quantity assessment of human poverty.

If deprivation is considered not only in terms of material goods, but also of other values (human capital, social capital, involvement in civil and social life), mention is made of “multidimensional poverty”. The latter is linked to complex problems such as social marginalisation and the studies describing it refer to issues such as marginalizing and exclusion.

For an overview of the terminology, please refer to the comprehensive “Glossary” by M. Mowafi and M. Khawaja [10].

Poverty, health and development in the contemporary world: some examples

There are many national and international organisations which provide synthesis and assessment reports with data on the economic, social and health situation in various parts of the world; the purpose here is not to try and reproduce data and analyses which will be the subject of authoritative articles published by magazines participating in the “Global Theme Issue on Poverty and Human Journals Development”.

It seems appropriate, however, to mention some data and a few projects which, in the months before the Global Theme Issue was published, have been the subject of attention also by the general public.

On 16 June 2006 the World Health Organization (WHO) presented the report *Preventing disease through healthy environments* [11]. This text is probably one of the most comprehensive and systematic studies to date as regards the way preventable risk factors contributed to a wide range of diseases and accidents. The report focuses on the environmental causes of disease and on how the different pathologies can be affected by the environment. The data show how it is actually possible to reduce the number of deaths, diseases and disabilities every year by means of a suitable environmental policy. According to the report, the deaths caused by environmental factors which could be otherwise prevented are more than thirteen million. In less developed countries almost 30% of deaths is due to preventable causes.

On 13 June 2007, in Vienna, the WHO also presented the research work *Environmental burden of disease: country profiles* [12], analysing, for each country in the world, the consequences on health of environmental conditions related, for example, to ultraviolet radiation, noise, dangerous agricultural work, harmful conditions on the workplace and on the road, climate and ecosystem changes, drawing conclusion on a country-by-country basis. The conclusion is that no country is exempt from impacts on health due to environmental risks and, more specifically, that the most serious situations are in poor countries, such as Angola, Burkina Faso, Mali and Afghanistan. Also according to the WHO, 13 million deaths every year are related to these conditions, many of which could be easily removed.

A high-impact visual representation of inequalities is offered by the project called “Worldmapper”

(www.worldmapper.org), whose strongly evocative images are much more eloquent than many words. Worldmapper is based on an algorithm which elaborates maps of populations and their conditions as opposed to territories [13]. The maps in these atlases are used to describe the relationships between the environment, socio-sanitary situation and poverty, also on the level of individual nations. Amongst the most recent, mention should be made of the Nature's benefits in Kenya. An atlas of ecosystems and human well-being, report presented on 30 May 2007; the latter contains a graphic account of population density, food resources, biodiversity, climate parameters, economic resources, average income and expenditure per household, and more [14].

The data pointing to serious economic, social and health deficiencies in whole populations are undoubtedly cause for concern. Mention should be made of three elements in particular.

First of all the fact that children are often the most vulnerable group. The monitoring activity by the International Child Development Steering Group published by *The Lancet* showed that more than 200 million children under two years of age are losing their cognitive development potential because of poverty, poor health, insufficient nutrition and health care [15, 16].

Secondly, economic growth does not necessarily entail an improvement in health conditions. India is a case in point. This country has been developing rapidly and intensely from an economic viewpoint over the past few years; at the same time the children malnutrition rate remains very high (for those aged between 0 and 3 years, in the 2000-2006 period, it went from 35 to 33%). The health situation is in many respects paradoxical. Almost 20% of children aged between 10 and 16 in India is obese; economic well-being has led to a diet which is more abundant but worse in terms of quality (in school canteens, snacks and fried food are widely served). Many health problems among Indian children, however, are a result of women's malnourishment during pregnancy: some children are born underweight and inappropriately breast-fed, which often hinders their development [17]. On the other hand, there is an intertwining of elements which makes situations extremely complex, meaning that disadvantaged economic conditions are not always associated with worse epidemiology conditions; this was confirmed, for example, by a longitudinal study focusing on the situation in England during the thirty-year period between 1971 and 2001 [18].

The third element is that, although history shows that the greatest health impact of many diseases is borne by the poorer social classes, statistical models pointing to possible future scenarios indicate that, unfortunately, no significant improvements in this respect are to be expected in the near future. In the last issue of the year 2006, *The Lancet* published a study by a group of US and Australian authors,

coordinated by Christopher Murray, where the data used was related to the Spanish influenza epidemic between 1918 and 1920 to evaluate what could have happened in 2004 if a similar event had occurred worldwide. The authors conclude that the number of victims of the pandemic could have ranged between 51 and 81 million, and that as many as 96% of them would have been from developing countries, that is to say from poor populations [19, 20].

Some recent publications about the relationship between poverty, human development, economy and health

A. In English

Anand S, Peter F, Sen A (Ed.). *Public health, ethics and equity* [21]. It is a 316-page book which is based on a series of seminars held by various authors at the end of the Nineties. The wide range of authors and positions is at the same time an asset (because of the number of proposals) and a limitation (because they are so heterogeneous). The book as a whole offers a sufficiently comprehensive overview of the way the main philosophical theories interpret the topic of health injustice. Particular attention is devoted to the idea of justice put forward by John Rawls and by Amartya Sen.

Bartley M. *Health inequality: an introduction to concepts, theories and methods* [22]. It is a 240-page book which outlines theories, concepts and methods used to study inequalities in the health sector. The eleven chapters are accompanied by tables, figures and a useful list of references. The main models of health sociology are described, with specific reference to inequalities (psycho-social, materialistic, and others).

Davey Smith G. *Health inequalities: lifecourse approaches* [23]. It is a 548-page book which contains thirty-nine articles written by the author alone or with co-authors. It also includes a short essay based on an accident in Nicaragua. The text contains abundant documentation as regards epidemiology data and risk factors for all main pathologies. The data are organised in order to provide an in-depth and comprehensive picture of inequalities on a social, geographical, ethnic, cultural and historic basis. The author highlights the relationships between various social processes and different risk factors to which the population is exposed. The material collected in the book covers a time span ranging between the end of the 1980s and the early 21st century; it shows how social factors play a crucial role in leading to inequalities. In the extensive introduction the author offers an overall view of the situations described in the individual chapters.

Evans T, Whitehead M, Dierchisen F, Bhuiya A, Wirth M (Ed.). *Challenging inequities in health* [24]. It is a 348-page book where the topic of inequalities

is dealt with in various health-care sectors and in different countries: Bangladesh (the starting point for the project which made the book possible), China, Chile, Japan, Great Britain, Kenya, Mexico, Russia, United States, South Africa, Sweden, Tanzania, Vietnam. Particular attention is paid to searching for the root causes of inequalities.

Farmer P. *Pathologies of power. Health, human rights, and the new war on the poor* [25]. It is a 402-page book. Farmer has written many books and is also the protagonist of a volume by Tracy Kidder published in 2003 [26] where his work in various countries is described as founder of "Partner in Health" and, in person, as doctor in disadvantaged parts of the world (especially in Latin America). Farmer writes in *Pathologies of power* that the book "is a physician anthropologist's effort to reveal the ways in which the most basic right – the right to survive – is trampled in an age of great affluence, and it argues that the matter should be considered the most pressing one of our times" [25, p. 6]. According to the author, social and health inequalities are "structural violences" and call for the adoption of new cross-border justice policies. The author uses the language and argumentative forms typical of socialist, anti-globalisation, neo-Marxist culture and literature. Some of the author's positions are also typical of the theology of liberation. The volume includes an extensive introduction by the Nobel prize for economics Amartya Sen.

Fogel RW. *The escape from hunger and premature death, 1700 – 2100. Europe, America, and the Third World* [27]. It is a 218-page book. The author, Nobel prize for economics in 1993, teaches at Chicago University, where he is in charge of the Population Economic Centre. His work has concentrated on issues of poverty and how to combat it. The analysis presented in the book is multi-disciplinary: it analyses trends in health, employment, production, demography, over a four-century time span, considering Europe, America and the Third World. The author concludes that developing a health culture is essential for social progress and development.

Gruskin S, Grodin M, Annas GJ, Marks SP. *Perspectives on health and human rights* [28]. It is a 649-page book which follows "Health and human rights: a reader", published in 1999 (see also). Like the previous volume, it is a comprehensive and rich anthology of texts by different authors who adopt a variety of perspectives. The variety of topics and positions make for an extremely heterogeneous and strongly inter-disciplinary book. The contributions are divided into eight sections where the relationships are analysed between health and human rights (part 1), their development and evolution (part 2), emerging technologies (part 3), reproductive health (part 4), violence (part 5), the methods and indicators to monitor respect of human rights in health

(part 6), some examples from specific geographical areas (part 7), some areas and initiatives to promote human rights in health, including training and international law (part 8). The text can be regarded as both a reference book, also in the academic sector, and as operational guide to decision-making in public health, even though some commentators have criticised the almost total absence of reference to particularly topical subjects (for example SARS and the bio-terrorism threat [29, 30]).

Healy J, McKee M (Ed.). *Accessing health care* [31]. It is a 256-page book which describes in detail how the treatment methods used for minorities in Europe and in the Commonwealth very often affected their health conditions. The editors are firmly convinced that local disparities reflect disparities on a global level and they argue that globalisation phenomena tend to marginalize the less advantaged groups in society. The book consists of sixteen chapters by twenty-eight authors, each with his own style and way of dealing with the topics. As a whole, however, it provides an effective comparison between the situation in the individual countries described.

Hofrichter R (Ed.). *Health and social justice: politics, ideology and inequity in the distribution of disease* [32]. It is a 688-page book which features contributions by different authors on public health issues. Some of them are original works, others had already been published in specialised magazines. The book consists of twenty-seven chapters. Even though they are very heterogeneous, the contributions describe health determining factors as part of a comprehensive framework, which includes economic, political, social, cultural aspects, pointing out that the approaches where these factors are regarded as pertaining to individuals are inadequate. The introductory essay highlights some fundamental aspects which run across the whole volume and defines social justice as "an ongoing series of relationships that permeate everyday life", arguing in favour of the "empowerment of all social members, along with democratic and transparent structures to promote social goals". The first section includes contributions about health inequalities and the way in which they affect political, economic and social mechanisms. The second part focuses on a few ideologies and paradigms which affect the way public health responds to inequalities. In the final section of the book concrete actions are suggested in order to reduce or eliminate inequalities.

Levy BS, Sidel W (Ed.). *Social injustice and public health* [33]. It is a 529-page book which includes contributions by fifty authors. Numerous topics are dealt with in respect of the relationship between social justice and health conditions. The text is divided into five sections. The first one introduces some basic concepts, focusing in particular on social justice. The latter is defined by the authors in two ways, consist-

ently used in the book. The first definition is: “denial or violation of economic, socio-cultural, political or civil rights” by certain population groups within a society; the second definition is a “set of policies or actions that adversely affect the societal conditions in which people live”. The rest of the book is divided into sections which reflect these definitions. The second section deals with specific social groups whose health conditions are affected by social injustice phenomena (convicts, homeless, migrants, refugees, the elderly and others). The third part of the book analyses specific public health issues (for example infectious diseases, nutrition, chronic diseases, mental health, working conditions). The fourth and final section contains operational suggestions as regards health policies, training, national and international standard provisions. Specific attention is devoted to war situations.

Mackenbach J, Bakker M (Ed.). *Reducing inequalities in health: a European perspective* [34]. It is a 378-page book which does not simply describe the nature and scope of health inequalities, but also develops a critical analysis of the various policies aimed at reducing them. As underlined in the title, the European case is examined. The first section described interventions on specific aspects (for example: nutrition, policies to counteract cigarette smoking, and others). The second section is geographically-based and examines health policies in various European countries. The analyses developed in the book are often harsh: many health policies are criticised because their effectiveness is limited and there is often little evidence of useful data to monitor the efficiency of interventions and health policies. From this perspective, rather than putting forward solutions for health inequality problems, the book seems to point to shortcomings in knowledge and intervention possibilities which still characterise part of public health in various countries.

Mann J, Gruskin S, Grodin MA, Annas GJ (Ed.). *Health and human rights. A reader* [35]. It is a 648-page book. It is an anthology of texts on the issue of relationships between health and human rights. In 2005 a second volume was published, entitled *Perspectives on health and human rights* edited by Gruskin *et al.* (see also) which features other contributions on the topic and integrates the first volume. The book is divided into six sections. The first one includes introductory essays on the relationship between human rights and public health. Section two studies the impact of health policies and programmes on human rights. The third section considers the health impact caused by human rights violations. Part four explores “the inextricable linkage between health and human rights”. The fifth part is entitled “Medicine and human rights” and examines some relevant topics from an ethical viewpoint (the Nuremberg code, informed consent in developing countries, and others). Part six is devoted to

“Moving from theory to action”. The annex includes some integral institutional reference documents as well as a list of selected material.

Powers M, Faden R. *Social justice. The moral foundations of public health and health policies* [36]. It is a 230-page book where the authors analyse the problem of social justice as part of public health issues, comparing the approach by several authors (John Rawls, Amartya Sen, Martha Nussbaum). According to the authors, the various solutions put forward with respect to social justice and equity problems in the health sector, even though the theoretical foundation offered is sufficiently strong, sometimes do not solve concrete situations of distribution justice. The authors suggest a path divided into several steps to make sure that decision-makers in the area of health policies promote actions which are mindful of social justice criteria.

Rhodes R, Battin MP, Silvers A (Ed.). *Medicine and social justice. Essays on the distribution of health care* [37]. It is a 470-page book divided into four sections which contain contributions by forty-one authors. The first section, including seven essays, is dedicated to theoretical foundations. Starting from different perspectives and using different arguments, the authors express their views about the ideal theoretical foundations of health justice, which should be freed from the constraints imposed by the real world. Reference is made in particular to the well-known theory of justice by John Rawls [38]. The second part focuses on some aspects of the organisation of health services and the allocation of resources in the United States Australia, Great Britain, Italy and in Scandinavian countries. The third part, which includes nine essays, examines the specific requirements of different social groups with a specific connotation (ethnicity, gender, disability, mental illness, childhood, poverty). Part four deals with some specific problems in modern health systems, such as organ transplant, individual and social responsibilities, work on the genome. Even though the study involves four countries, the main focus of attention is the United States health system.

Siegrist J, Marmot M (Ed.). *Social inequalities in health* [39]. It is a 268-page book which analyses in-depth the relationships between poverty in social structures and poverty in health conditions. The mechanisms which play a role in this respect are analysed from different angles. For example, mention is made of the relationships between working conditions and health, as well as between psycho-social factors and health. The book as a whole clearly highlights the inseparable relationship between social environment on the one and psychological and health element on the other. Mention is made in particular of the repercussions on health of social relations, depressive conditions, dissatisfaction, difficulty. The authors also underline the need to tackle the root

causes of problems: they think that the health effects caused by these factors are not sufficiently palliative; therefore it is essential to work on the root causes. From this perspective, some of the authors analyse the health models which are more effective to deal with inequalities in health. Particular attention is devoted to health systems in Great Britain and Scandinavian countries. The authors seem to be particularly interested in welfare state models which adopt actions aimed at redistributing income on the basis of equity principles.

Wilkinson R. *The impact of inequality: how to make sick societies healthier* [40]. It is a 304-page book which highlights the disparities in the health systems of many societies. The book criticises the ineffectiveness of many public health policies when facing health inequality issues: according to the author, very often policies are nothing more than empty rhetorical statements. Wilkinson argues that risk factors are often dealt with inadequately: a global approach to health problems is necessary, which also means including social considerations.

B. In French

Schneider-Bunner C. *Santé et justice sociale. L'économie des systèmes de santé face à l'éthique* [41]. It is a 274-page book which analyses the main perspectives taken in modern times when dealing with the topic of equity. More specifically, three criteria are described: liberal, egalitarian and based on the theories by John Rawls [41, p. 12-135]. After the first theoretical section, the author outlines concrete applications, selecting, among the various theories, the ones which are more or less explicitly adopted in various European health systems [41, p. 138-254]. The guiding thread of the book is the possibility of a practical compromise, on the operational level, between the different models in order to achieve as more equity as possible in health systems; according to the author, however, it is an illusion to try and find theoretical consensus between these models because they are so different that the search for a common "neutral" ground is utopian.

C. In Italian

Osservatorio Italiano sulla Salute Globale. *A caro prezzo. Le disuguaglianze nella salute. Secondo Rapporto dell'Osservatorio Italiano sulla Salute Globale* [42]. It is a 340-page book edited by the Osservatorio Italiano sulla Salute Globale and presented in Rome, at the Istituto Superiore di Sanità, on 2 December 2006 on the occasion of the conference "Salute: privilegio o diritto universale?" (Health: a privilege or universal right?). The Osservatorio Italiano works to promote the right to health. The Report consists of three sections. The first one deals with the topic of the social origin of diseases and discusses the principles and concepts of inequalities in health. Part two describes the various aspects of "global inequalities" in health: the epidemiology profile, the effects of wars and catastrophes, production models and

work organisation, and others. The third part examines inequalities within nations. It includes a section dedicated to Europe and others devoted to examples from other nations (China, India, United States of America, Brazil, Uganda, Kazakhstan, Moldova). Moreover some specific aspects of inequalities are analysed: health services, lifestyles and others.

Sandrin L. (Ed.). *Solidarietà e giustizia in sanità* [43]. It is a 214-page book which contains the proceedings of the conference "Solidarietà e giustizia in sanità (Solidarity and justice in health)" organised at the Istituto Camillianum in Rome on 21 and 22 November 2006. The contributions featured in the book stimulate discussion on the various theories of justice and the allocation of resources in the health sector, underlining that they should always be based on the dignity of each individual person. In a context where personal autonomy, seen as absolute self-determination, is generally regarded as the fundamental basis for any ethical issue, the authors of the book invite everyone to consider what is "good" for human beings and to look for the answer by reflecting first of all about "who" is a human being.

Spagnolo G, Sacchini D, Pessina A, Lenoci M. *Etica e giustizia in sanità. Questioni generali, aspetti metodologici e organizzativi* [44]. It is a 399-page book which describes the model and topics of ethics and justice, with special reference to economics and the allocation of resources, not only in a theoretical and analytical way, but rather as part of an analysis of organisational and management aspects of health. It is therefore mainly an applicative approach. This does not prevent the authors from outlining with precision and clarity the theoretical foundations, along different lines: individualistic liberalism, utilitarianism, egalitarianism, personalism. According to the authors, the latter is the suitable approach to guarantee compliance with fundamental individual requirements, the core value for any ethical consideration.

PRECAUTION

General definition

According to the precautionary principle, the absence of certainties, taking into account the scientific and technical knowledge available at the moment, should not hinder the adoption of effective and proportionate measure aimed at preventing, at a socially acceptable cost, the risks of seriously damaging the environment or health.

The precautionary principle is therefore an action principle whereby public authorities are committed, without waiting for the progress of knowledge, to taking temporary and flexible measures to face potential health or environmental risks, in respect of which the scientific data available are insufficient, uncertain or contradictory.

The principle was formulated in the 1970s and initially made reference to environmental protection

[45]. It was then included also in various areas of public health and health protection [46].

Starting from the Eighties, the precautionary principle has been set out in numerous institutional documents, conventions, statements, treaties and in some regulations [47]. Its most notable affirmation is contained in item n.15 of the "Rio Statement", issued in 1992 at the end of the United Nations Conference on Environment and Health which reads: "With a view to protecting the environment, States shall largely apply, according to their capacity, the precautionary method. If there is a risk of serious or irreversible damage, the absence of absolute scientific certainty should not be used as a pretext to delay the adoption of suitable and effective measures, also in relation to cost, to prevent environmental degradation" [48]. The precautionary principle can therefore be summed up as follows: it is applied in situations of scientific uncertainty, where the decisions called for must be taken without waiting for advances in knowledge; it entails measures which are temporary, reversible or which can be adjusted whenever scientific information provides new decision-making elements; the research promoted must be aimed at reducing uncertainties; the burden of the proof does not rest on those who think they have been damaged, but rather on those who present new products or new technologies; it is a long-term policy, aimed at containing risks before they cause damage; it does not entail the expectation of an unachievable "zero risk" level.

In some circumstances, the precautionary principle has also been attributed legal value. Its status, however, is the subject of much discussion and literature because it is a concept which borders between legal principle [49], philosophical principle [50] and ethical value [51]. For this reason, some people prefer to avoid the commitment implied by the word "principle", and use phrases such as "precautionary approach", "precautionary policy" or the like [52] instead.

The precautionary principle has clear relevance in ethical terms: "The precautionary principle appeals to our sense of controlling risks, and it assigns responsibility to present generations to think about the consequences of their action for future generations. It has an intuitive moral appeal" [53].

Some recent publications on precaution and health

A. In English

Martuzzi M, Tickner JA (Ed.). *The precautionary principle: protecting public health, the environment and the future of our children* [54]. It is a 220-page text which contains documentation related to the World Health Organization (WHO) publication *Dealing with uncertainty: how can the precautionary principle help protect the future of our children*, prepared for the Fourth Ministerial Conference on Environment and Health held in Budapest, Hungary, in June

2004. The precautionary principle is examined from different perspectives (philosophical, legal, social, technical-scientific, and others), highlighting in particular: the relevance of prevention and precaution in all public health policies; the shift which has taken place in risk management policies from reactive to precautionary strategies; the increasingly frequent need to deal with complex situations characterised by great uncertainties; the importance of the precautionary principle for countries with economies in transition, where environmental and health problems are often particularly felt; the need to use precautionary criteria in a flexible way, based on the changes in circumstances.

Myers N, Raffensperger C (Ed.). *Precautionary tools for reshaping environmental policy* [55]. It is a 400-page book where cautionary criteria are considered as part of environmental policies. The text includes numerous practical criteria to be taken in consideration with a view to adapting the cautionary concept to the various circumstances. Reference is often made to specific cases, widely debated also among the general public (for example: DDT, genetically-modified organisms, and others).

B. In French

Boual JC, Brachet P (Ed.). *Santé et principe de précaution* [56]. It is a 126-page book which contains the proceedings of the Premier Symposium Européen sur le Principe de Précaution, which took place on 26 March 2002. The texts featured are a transcript of the symposium presentations and have the typical style of oral presentations.

De Sadleir N. *Les principes du pollueur-payeur, de prévention et de précaution. Essai sur la genèse et la portée juridique de quelques principe du droit de l'environnement* [57]. It is a 438-page text about the legal aspects of three widely-used principles in environmental policies: "polluter pays", prevention, precaution. For each of the three principles, a broad historic-juridical account is provided, with a wealth of precise legal references.

Ewald F, Gollier C, De Sadeleir N. *Le principe de précaution* [58]. It is a 128-page, book, small in size, published in the collection "Que sais-je?". As the title suggests, it is selection of short texts on individual topics, each of them offering the basic notions concerning the specific topic. The text consists of three sections, dedicated respectively to "political philosophy", to "legal status" and to the "economics of the precautionary principle".

Godard H (Ed.). *Le principe de précaution dans la conduite des affaires humaines* [59]. It is a 351-page book. The first author, researcher at the French Centre National de la Recherche Scientifique, deals with environmental policies and sustainable development; he has published a number of books about

the precautionary principle. The volume includes the proceedings of a conference about "Nature, Science and Society" which took place in Paris. First of all the conceptual value and philosophical implications of the precautionary principle are discussed. The analysis then moves on to its possible application in some technology sectors (aeronautics, road safety, non-ionising radiations, and others). Some environmental and health risks are then presented in reference to which the precautionary principle is often mentioned (these include, for example, climate changes and the greenhouse effect). A section is also dedicated to the juridical aspects of prevention. The book highlights pros and cons of the precautionary principle; as a whole "it certainly goes against the Anti-precaution approach which is still at work: the denial of risk, the refusal to listen to words from the "outside", paying a deaf ear to premonitory indices, the instrumental use of uncertainties and scientific controversies to paralyse public action, or also the transformation of arbitrary hypotheses, or only partially founded theories, into dogmas to defend the honour of a guild, are its most common manifestation. Precaution might lead to something better or worse, but the absence of precaution undoubtedly leads to the worst" [59, p. 32].

Godard O, Henry C, Lagadec P, Michel-Kerjan E. *Traité des nouveaux risques* [60]. It is a 620-page book, small in size, divided into three sections, one of which is entirely dedicated to precaution (the other two are dedicated to aspects related to it: "crisis" and "insurance"). The text presents and discusses the fundamental aspects which characterise risks: probability, seriousness, uncertainty, acceptability, responsibility, communication, and others. Abundant reference is made to examples based on concrete cases. The authors express their interest in policies founded on the precautionary principle, which they regard as an important contribution for "a new approach to the issue of risk in society" [60, p. 36].

Kourliski P. *Du bon usage du principe de précaution* [61]. It is a 175-page book which critically reviews, with a specialist's precision, but at the same time using a divulgative approach, the main characteristics of policies based on the precautionary principle. The text builds on some of the topics discussed in the book *Le principe de précaution*, written by the same author with Geneviève Viney upon request of the French Prime Minister (see also).

Kourliski P, Viney G. *Le principe de précaution. Rapport au Premier Ministre* [62]. It is a 250-page text, drafted in 1999 upon request of the French Prime Minister. The report is based on consultations with numerous experts from several countries, and contacts were made with numerous governments through the embassies. The book focuses on the various aspects of the precautionary principle: definitions; conceptual framework (concept of risk,

uncertainty, prudence, etc.); characteristics of the situations to which the principle can be applied; role of the various subjects involved (experts, scientists, citizens, decision-makers); legal and regulatory aspects. The report includes ten recommendations related to: definitions of the precautionary principle; technical-scientific expert reports; research and teaching; political and administrative decisions; safety devices; transparency, role of the media; genetically modified organisms, international relations; responsibilities.

Latouche S. *La déraison de la raison économique. Du délire d'efficacité au principe de précaution* [63]. It is a 223-page book by the well-known economist with Marxist ideas, whose theories have become famous the world over. His books deal with development, social and economic inequalities, injustices in international relations, "sustainable decrease", and "cultural colonisation" associated with globalisation issues. Adopting the position typical of a strongly politically-connoted environmentalism, the author blames the irrationality of production and consumption models in modern economically advanced societies. The argument is developed by referring to examples from all sectors of human production: from energy consumption, to bio-technology, to transport and international trade. According to the author, the modern production logic is: "Pourrissez-vous la vie les uns les autres le plus possible et le plus vite possible jusqu'à extinction de l'espèce" (Keep soiling each other's life as quickly as possible, until the species dies out). The author's conclusion is that such mechanism should be counteracted by means of "reasonable efficacy" and "returning to the phronésis advocated by Aristotle" [63, p. 126].

Lepage C, Guery F. *La politique de précaution* [64]. It is a 380-page book written with a divulgative approach, in the form of a dialogue between the two authors. Corinne Lepage is a former Minister of the Environment and one of the best-known legal experts in the environmental law sector; François Guery is dean of the Faculty of Philosophy in one of Lyon's universities. The first part of the book examines a few questions: bovine spongiform encephalopathy ("mad cow disease"), genetically modified organisms, chemical pollution, climate changes. The second section is based on a few theoretical assumptions (ethics of responsibility, philosophical foundations of precaution, relationships between precaution and progress). The third and last section is entitled "The perspectives", and deals with the topic from the viewpoint of the various stakeholders: citizens, politicians, experts.

C. In Italian

Battaglia F, Rosati A (Ed.). *Il principio di precauzione. I costi della non-scienza* [65]. It is a 206-page book which comprises the presentations given during the First International Congress of the Associazione

Galileo 2001, in Rome on 19 February 2004. The speakers express a variety of positions who go against those typical of environmentalist movements (and summarised above, for example quoting the book “La déraison de la raison économique” by Serge Latouche). According to the founders of the Associazione Galileo 2001 “certain decisions, dictated by fears which induce prudence but are devoid of a scientific basis, may have dramatic consequences on citizens’ lives and finances. This is how so-called precaution is not only useless, but even harmful; examples of this in our country are the policies adopted in respect of electromagnetic fields, plant bio-technologies, nuclear energy, soil protection, climate changes, waste disposal”. The book starts with the “Manifesto Galileo 2001 per la libertà e la dignità della scienza [for the freedom and dignity of science]”, presented on the same occasion.

Marini L. *Il principio di precauzione nel diritto internazionale e comunitario. Disciplina del commercio di organismi geneticamente modificati e profili di sicurezza alimentare* [66]. It is a 431-page book, mainly dedicated to legal aspects and specifically to European law. The text focuses in particular on the issue of genetically modified organisms. The discussion, however, is extended to encompass several aspects of the precautionary principle and its applications, not limited to the bio-technology sector. The contents are derived partly from the work done by the author as part of the working group of the National Bio-ethics Committee in charge of drafting the document “The precautionary principle: bio-ethical, philosophical, legal profiles”, approved by the Committee in its final version on 18 April 2004 [67].

PRECAUTIONARY PRINCIPLE AND SOLIDARITY

Having provided some definitions and an overview of examples related to poverty and development and precaution, the following section will focus on the question whether the precautionary principle can contribute to development.

For greater clarity, it might be useful to state from the outset that the answer presented here will be yes, even though, as will be shown in the following paragraphs, there are noticeable weaknesses and counterarguments.

Before dealing with the more technical aspects of the economic development – precaution combination, it might be useful to say something about the possible relationships between precaution and solidarity.

There is no doubt that solidarity is an essential component of development. Assuming that precaution also implies a “solidaristic” attitude, the conclusion is that it could, potentially at least, favour its development.

As regards the philosophical standpoint, precaution can be approached from different perspectives.

Utilitarianism

The precautionary principle is an approach geared towards the future and aimed at preventing damage, minimizing risks and avoiding irreparable consequences. In this respect it can be seen as a form of “negative utilitarianism”: traditional utilitarianism, indeed, states that it is morally fair to maximise pleasure and benefits [68]; the precautionary principle postulates that it is morally admissible to do whatever possible to avoid inflicting unnecessary suffering, also to future generations.

More specifically, the English-speaking culture adopts the utilitarian approach to guide a number of choices, and the cautionary principle is largely adopted. Precaution, however, is not exclusive to this approach.

Maximin

The precautionary principle, in fact, is not dissimilar from the strategy usually known as “maximin”, mainly disseminated by John Rawls [69]. According to this theory, it is necessary to always choose what is most likely to lead to the best outcome in the worst-case scenario. In other words, the idea is to “maximize the minimal good outcome” of our choices, and therefore “always distribute risk in such a way as to hurt less those who are worst off” [70].

Solidarity

Broadening the scope even further, it is also possible to say that precaution can be regarded as a form of solidarity; for this reason it cannot be exclusively identified either with utilitarianism or with the “maximin” approach. Precaution seen as solidarity is particularly interesting in respect of the other term in the combination considered here, that is to say development.

Precaution as a “virtue” complies with the solidarity attitude. Since the latter is generally regarded as the opposite of utilitarianism, there seems to be a sort of paradox or contradiction. The resulting conclusion is that precaution can be regarded as consisting in a variety of approaches, also radically different one from the other.

As a matter of fact, solidarity can be seen in different ways. Matti Häyry makes a distinction between various ways of expressing solidarity: being altruistic, sympathetic, universally benevolent, just [71]. According to the author being altruistic is a general moral principle underlying selfless “good deeds” to help others. Being sympathetic, on the contrary, is regarded as a psychological attitude which leads everyone to naturally feeling kind with respect to others, sharing in their joy and suffering. Universal benevolence is the attitude, which can imply being

altruistic but also egoistic, leading to the promotion of the greater good for the largest number of individuals. Justice, finally, may be an expression of solidarity because every human being, as a rational agent, perceives rights and duties in respect of other humans. The same author argues that, according to other scholars, solidarity cannot be traced back to the psychological sociological and political categories mentioned above: the ways in which solidarity is expressed must be spontaneous, mutual and not externally controlled. The author concludes, therefore, that solidarity cannot be seen within an exclusively utilitarian or an exclusively liberal framework.

The solidarity attitude has accompanied the development of a large part of Western thinking and culture: solidarity has been a typical feature of Christianity for two thousand years, and, in philosophy, of personalism. Solidarity is seen here as being open and generous towards other people, putting their best interest before our own, without expecting anything in return. However, just as prudence and precaution are not an exclusive trait of any one philosophy, solidarity is certainly not a trait exclusively belonging to Christianity or personalism, because it can be found in a variety of cultures.

According to Häyry those who adhere to the ethics of solidarity, especially in religion, tend to regard their position as the true bearer of dignity and individual integrity values, as opposed to liberal and utilitarian ethics, seen as cold and calculating. Precaution, argues the author, can provide a meeting point. Weighing up costs and benefits, in a utilitarian manner, is not bad in itself because it can lead to something good; on the other hand, in an uncertain situation, prudence and precaution are forms of selfishness; this is not necessarily opposed to the pragmatic approach typical of utilitarianism. Solidarity and precaution can therefore bring different approaches closer together.

POVERTY AND PRECAUTION IN THE SOCIAL DOCTRINE OF THE CATHOLIC CHURCH: AN INTRODUCTION

Mention has been made of solidarity as a virtue highlighted also by Christian ethics.

The documents published by the Church on social development are so numerous that it would be futile to try and give a comprehensive account here; it will be sufficient to remind the reader of the great attention paid by the Church to this topic. Such attention is shown, for example, by the fact that the great challenges posed by deprivation and diseases which, though curable, affect whole populations, are constantly mentioned in the speeches made by Popes at the beginning of the year to the Holy See Diplomatic Corps; these probably provide the greatest and most comprehensive opportunity to analyse the opinion expressed in Popes' speeches as regards the social conditions of humanity at large. Talking to the Diplomatic Corps on 8 January 2007, Benedict XVI, expressly voiced the hope of a future with

more solidarity, peace and where everyone's rights are respected: the unacceptable scandal of hunger, like that of conflicts "reminds us of the urgent need to eliminate the structural causes of global economic dysfunction and to correct models of growth that seem incapable of guaranteeing respect for the environment and for integral human development, both now and in the future" [72].

In numerous encyclical letters mention is made of problems related to poverty, underdevelopment, inadequate health conditions of whole populations. An example of this is the encyclical letter *Sollicitudo rei socialis* by John Paul II which says: "I wish to call attention to a number of general indicators, without excluding other specific ones. Without going into an analysis of figures and statistics, it is sufficient to face squarely the reality of an innumerable multitude of people – children, adults and the elderly – in other words, real and unique human persons, who are suffering under the intolerable burden of poverty. There are many millions who are deprived of hope due to the fact that, in many parts of the world, their situation has noticeably worsened (...). The first negative observation to make is the persistence and often the widening of the gap between the areas of the so-called developed North and the developing South. This geographical terminology is only indicative, since one cannot ignore the fact that the frontiers of wealth and poverty intersect within the societies themselves, whether developed or developing. In fact, just as social inequalities down to the level of poverty exist in rich countries, so, in parallel fashion, in the less developed countries one often sees manifestations of selfishness and a flaunting of wealth which is as disconcerting, as it is scandalous. The abundance of goods and services available in some parts of the world, particularly in the developed North, is matched in the South by an unacceptable delay, and it is precisely in this geopolitical area that the major part of the human race lives. Looking at all the various sectors – the production and distribution of foodstuffs, hygiene, health and housing, availability of drinking water, working conditions (especially for women), life expectancy and other economic and social indicators – the general picture is a disappointing one, both considered in itself and in relation to the corresponding data of the more developed countries. The word "gap" returns spontaneously to mind" [73].

In two importance reference texts, the *Catechism of the Catholic Church* and the *Compendium of the Social Doctrine of the Church* the topics of poverty and development are dealt with at length. More specifically the *Catechism of the Catholic Church* dedicates to them paragraphs 2544 and following in the chapter dedicated to loving our fellow human beings (part three, section two chapter two) [74]. Development, poverty, solidarity are topics which run across the whole *Compendium of the Social Doctrine of the Church*. It is interesting to note that the latter text explicitly refers to the precautionary

principle, describing it as follows: “The authorities called to make decisions concerning health and environmental risks sometimes find themselves facing a situation in which available scientific data are contradictory or quantitatively scarce. It may then be appropriate to base evaluations on the “precautionary principle”, which does not mean applying rules but certain guidelines aimed at managing the situation of uncertainty. This shows the need for making temporary decisions that may be modified on the basis of new facts that eventually become known. Such decisions must be proportional with respect to provisions already taken for other risks. Prudent policies, based on the precautionary principle require that decisions be based on a comparison of the risks and benefits foreseen for the various possible alternatives, including the decision not to intervene. This precautionary approach is connected with the need to encourage every effort for acquiring more thorough knowledge, in the full awareness that science is not able to come to quick conclusions about the absence of risk. The circumstances of uncertainty and provisional solutions make it particularly important that the decision-making process be transparent” [75]. Even though the paragraph about the precautionary principle does not make explicit reference to poverty-related questions, one cannot fail to note that in the *Compendium of the Social Doctrine of the Church*, the Holy See decided to mention in an official text the precautionary “principle” alongside the traditional principles of the Catholic social doctrine (primary role of the individual, subsidiary, solidarity), which have always been regarded by the Catholic Church as prerequisites for social development and the fight against poverty [76]. The enunciation of precautionary principle in the *Compendium of the Social Doctrine of the Church*, however, refers to it more as a way of behaviour as opposed to a substantive moral principle.

PRECAUTIONARY PRINCIPLE AND ECONOMICS

Precaution as a development factor

Continuing the analysis of the “precaution” and “solidarity” concepts, having attempted to define the terms in question and to compare them, the question arises of whether the cautionary approach may support development in the broadest sense of the word, not only economically [77, 78].

Without going into the technicalities of economic theories and instruments, it might be useful to refer to a series of presentations by Frank Ackerman, and more specifically to the report commissioned by the Alliance for a Healthy Tomorrow [79]. The author argues that the precautionary principle makes not only “good scientific”, but also “sound economic” sense for at least four reasons.

The first reason is related to the possibility of creating job opportunities. The application of the precautionary principle, indeed, does not lead to

a reduction of the labour force: on the contrary it entails the adoption of technologies which require more manpower (for example energy-efficient technologies or the reuse of waste material).

The second reason is that, contrary to spontaneously-voiced opinions, the precautionary principle does not involve extra costs for industries. According to the author, indeed, the costs required by adjusting to standards for environmental protection in general have a very marginal effect on companies’ budgets and do not increase when cautionary measures are adopted.

The third reason suggested by Ackerman has to do with the innovation drive to be derived from the application of the precautionary principle. According to the author, in fact, the regulations which impose compliance with environmental requirements and the adoption of cautionary measures are often a driver behind efficiency. Without such input, continues Ackerman, businesses often fail to consider appropriately all possible alternatives and adopt inefficient procedures, with a limited performance and, subsequently more expensive.

The fourth reason is related to the possibility of reducing, thanks to the adoption of “preventive cautionary measures”, those health and environmental costs which would otherwise have to be allocated later on to try and repair the damage after it has occurred.

From these arguments as a whole, Ackerman concludes that the interventions to apply the precautionary principle are economically advantageous compared to refraining from any type of action, even though at first sight refraining from action might seem inexpensive.

Arguments against the precautionary principle

A. In scientific, economical, political literature

Not everyone agrees with Ackerman’s theories. According to other authors, a careless application of the precautionary principle could have negative consequences, some of them serious: the precautionary principle has been subject to criticism, both mild, by inviting to “caution” in using “precaution” [80], and very strong, highlighting inconsistencies in respect of the strict “decision theories” [81] or which regard as scientifically unfounded any decision based on assessments where there is a marked subjective component [82].

A recurrent position taken by critics, also from different standpoints, of the precautionary principle is that the latter expects to base decisions and actions on scientifically uncertain data, giving them precedence over more rationally solid patterns. The most consolidated procedures include all quantitative cost-benefit analyses, dominating most environmental and health policy choices made today. The precautionary principle, compared to these procedures, seems then too vague and arbitrary to provide solid grounds for rational decisions [58, p. 104-126].

Also as regards those aspects that are most relevant here, namely the possible impacts of the precautionary principle on development, criticisms have been made also in this respect: in literature there are those who argue that adopting the precautionary principle can: lead to replacing science with politics [83]; cause scientific progress to be suffocated by red tape [84]; be used instrumentally for commercial purposes [85]; be an impediment for the progress of science and, subsequently for development [86]; prevent the dissemination of useful techniques and products [87]; generate elusive expectations of being able to achieve “zero risk” [88]. The European Policy Centre voiced concerns in this respect in the document entitled “The politicisation of science and the precautionary principle” [89] published on 5 July 1999. Moreover, the document argues that: “There is an increasing tendency for decision-makers throughout the EU to apply the precautionary principle whenever there is a potentially serious threat to health, safety or the environment and when scientific data is either “uncertain” or “insufficient”. In the way it is now being used, it is an example for the trend toward a politicisation of science. The precautionary principle must be clearly defined in such a way it does not give rise to this danger. It should be used only in exceptional circumstances. It should not be applied where there is a breakdown in communication between politicians and scientists. It should not be used to second-guess scientists on scientific issues” [89, p. 6]. The conclusion reached is that “Governments must, therefore, ensure that there is transparency throughout the risk analysis process and that the process strikes the right balance between scientific progress and precaution. Governments must also ensure that the scientific advice needed to assist with decision-making is separated from the political act of decision-making itself, so that there is no politicisation of science” [89, p. 7]. Even stronger tones are used by the French Academy of Sciences which “recommends that the precautionary principle not be introduced into texts with a constitutional value or into organic laws because it is likely to have perverse effects, possibly disastrous consequences on the future progress of our well-being, health and environment” [90]. Those who see the precautionary principle as a possible hindrance to development are often unwilling to accept either the “hard-line” expressions (up to the expectation of “zero risks”) of the precautionary principle, or its “weak” forms (mitigated by various corrections): the former are regarded as unacceptable because they can easily lead to paralysis in decision-making processes, while the latter are nothing but a less rigorous version of the cost-benefit analysis. These authors, therefore, argue that the policies implemented should be based on the precautionary principle only in the case of catastrophic risks, while in all other cases the traditional cost/benefit analysis methods should be applied [91].

B. In international jurisprudence

As already mentioned, the precautionary principle is widely integrated in laws and statements of principles on an international level: it is found in treaties, conventions and agreements.

On an international level there are, however, judgments which tend to slow down its application: even though the importance of environmental protection is acknowledged, these decisions see the precautionary principle as a possible hindrance for economic development.

As example in this respect is the dispute which took place in the 1890s and 1990s between Hungary and the then unified state of Czechoslovakia. Hungary was opposed, on the basis of the precautionary principle, to a treaty previously stipulated with its neighbouring State concerning the construction of waterworks on the Danube; this led to a dispute which was taken to the International Court of Justice. In a ruling issued on 25 September 1997, the latter concluded in favour of Czechoslovakia, stating that there was no serious and imminent danger because the damage claimed by Hungarian authorities was uncertain in nature. The judges, in fact, argue that the alleged damage mentioned by Hungary is a long-term situation, whose “effects cannot be easily assessed” and that the “most important factor” to consider is that the damage “remains uncertain” [92]. In its ruling the Court refers to the fact that the application of the precautionary principle might hinder development.

A similar conclusion was reached by the European Court of Human Rights in a ruling issued on 26 August 1997. The decision is related to a dispute between the Swiss Federal Council, intending to continue the activity of a nuclear power plant, and a group of workers who claimed possible health damage due to a technical flaw in the plant. According to the judges the “direct link between the conditions under which the power plant is used” and the “protection of health integrity” is hypothetical. The Court therefore ruled in favour of the Swiss Federal Council, also referring to the economic damage which would have been caused by blocking the plant’s activity [93].

Similar arguments are found in two decisions by the World Trade Organization issued on 18 August 1997. According to these rulings, identifying a risk associated with the presence of hormones in meat is a “*conditio sine qua non*” for risk assessment as stipulated by article 5 of the Agreement on health and phyto-sanitary measures; in the light of this the decision on meat trade by the European Union are unjustified. The WTO specifies that restrictive trade exchange measures are acceptable only if they are based on clearly proven risks and not on uncertain hypotheses [94, 95].

C. Possible answers to criticisms: precaution is not in contrast with cost-benefit analyses

On an operational level, regardless of theoretical speculation as to the philosophical status of the precautionary principle, the criticism which, if justified, would probably hinder more than others the appli-

cation of the principle is the alleged methodological and scientific weakness of precaution compared to the rigorous and mathematically-supported cost-benefit analyses.

It is, however, also possible to say that the precautionary principle does not automatically entail an analysis which is technically not rigorous because, on the contrary, it adds further elements to it.

The following is a list of possible responses to the objections.

- *Cost-benefit analyses have practical advantages, but also problems: precaution may help to solve such problems.*

There is no doubt that cost-benefit analyses have some practical advantages, for example: they help clear and transparent decision-making processes, they make choices explicit, allow for quantification of the impact of any action in evident terms. All this, on the other hand, raises sometimes serious questions. The cost-benefit analysis in the health sector, in fact, is an attempt to express all effects in quantitative terms, more specifically in economic terms: the economic effects are measured using monetary units; the health effects are initially expressed in epidemiology terms (mortality, morbidity, etc.), then translated into monetary terms; the environmental effects, by the same token, are initially expressed in terms of damage to the ecosystems and then as economic amounts. Moreover the cost-benefit analysis tries to express in the same terms also the future expected results. This leads to well-known problems, widely discussed in specialised literature, in particular the fact that many values, human life in the first place, are not financially quantifiable [96]. The analysis based on the precautionary principle; avoid bringing back all values to monetary costs.

- *It is important to consider parameters which go beyond the cost/benefit analysis and rigorous scientific proof.*

It is clear and self-evident that the perception of risk is affected by a large number of factors, also subjective, which do not fall within the cold numerical logic of the cost/benefit analysis [97, 98]. The choices made by individuals in general, specifically with reference to risks, are based on a variety of factors and not only on utilitarian considerations.

- *Many environmental and health risks do not completely fit the traditional paradigms of a cost-benefit analysis.*

This depends on the variable, complex, and random features often intrinsic to health and environmental issues. The latter are frequently determined by multiple variables, which as a whole are strongly unpredictable and therefore unsuitable for normal risk assessment methods.

- *There are situations where cost-benefit analyses cannot be applied.*

When the likelihood and scope of the risks involved are known, it is possible to apply rigorous cost-benefit analysis methods. With strongly ambiguous and

uncertain situations, on the other hand, it is very difficult, not to say impossible, to apply rigorous cost-benefit analysis methods. The precautionary paradigm might therefore be applied more frequently that could be imagined: there are frequent cases where uncertainty as to the likelihood and scope of a situation is almost total. In these cases resorting to precaution might be a rigorous theory for decision-making. In this respect, mention should be made of the analysis by Kenneth Arrow and Leonid Hurwicz as regards decision-making processes under the conditions they define as "complete ignorance". The work by Arrow and Hurwicz, published in the 1970s without much resonance [99], was taken up in the 1990s [100] and stirred lively interest. The analysis points out that in situations of total ignorance, the validity of forecasts is not affected by the number of people who repeat them: calculating the average, in fact, implies that all forecasts are equally probable, which is not the same as complete ignorance. In situations of complete ignorance, all the information used to make decisions is limited to the best and in the worst of cases, while the distribution of forecasts between the two extremes is irrelevant. Under these conditions the precautionary approach seems particularly relevant.

- *The cost-benefit analysis is "risk-neutral".*

The precautionary approach, unlike the cost-benefit analysis, attributes a different weight to different risks. This aspect may be technically relevant and it certainly is from an ethical standpoint.

- *Faced with uncertainty, the most spontaneous reaction is an increasingly in-depth cost/benefit analysis, but this is not always helpful.*

There is often a tendency to interpret events as being determined exclusively by strict laws which can be known, without sufficiently considering the possible contradictions, unexpected twists, changes. Technical analysis is indispensable, but an increasing number of variables and multiple hypotheses, though helping mathematical precision, entail a risk of losing their predictive value.

- *Cost-benefit analyses do not allow for the level of involvement which can be achieved with precautionary policies.*

The degree of involvement by the parties involved is one of the factors which affect the acceptability of choices. In the case of possible, but strongly uncertain damage, transparency, involvement, negotiation are particularly important and could even be more relevant than technical correctness when it comes to defending a choice.

AN OVERALL VIEW

In view of complex and often not very encouraging data, the question arises as to whether precaution can give an effective contribution to development.

Data from the research work *Environmental burden of disease: country profiles* by WHO show “huge inequalities but also demonstrate that in every country, people’s health could be improved by reducing environmental risks”. Moreover “low income countries suffer the most from environmental health factors, losing about twenty times more healthy years of life per person per year than high income countries” [101].

These data point to the close connection between socio-economic conditions and health risks. It is therefore especially important to work on both fronts [102]. In this respect, mention should be made of the what are known as “cautionary policies” based on the application of the precautionary principle.

For the sake of clarity, it should be stressed that when health and environmental risks (which might be the cause of damage, inequalities, poverty, underdevelopment) are known, precaution is not relevant.

On the other hand, however, precaution becomes relevant when dealing with uncertainties and this is a very frequent situation. As previously mentioned, precaution is sometimes regarded as being separate from or even opposed to the cost-benefit analysis method. An attempt has also been made to try and argue that both approaches are, as a matter of fact, not completely separate and it might indeed be useful to combine them. Regardless of the consideration given to this, when dealing with extremely complex economic, social and health situations as those initially outlined here, there is no disputing the fact that the choices cannot be traced back to mere numerical cost-benefit ratios. In this situation

reference is often made, not by chance, to other tools, such as for example “trade-off analysis” and Technology Option Analysis (OTA). The former is based on assumptions not very dissimilar from those made by the cost-benefit analysis, but “natural” units of measurement are chosen, thus avoiding the technical, and also ethical, question of translating non-economic value into monetary terms. This method preserves much of the rigorosity of the cost-benefit analysis, but greater weight is attributed to negotiation and to the responsibility of the various players. The second approach does not require a quantification of all variables: on the contrary it is aimed at showing, in a comparative way, that one choice is better than another in terms of economic, environmental and health consequences. In both cases precaution may play a relevant role.

There are several arguments in favour of the adoption of the precautionary principle as a criterion which might lead to health, environmental and economic advantages; these include: the fact that uncertainty is an inescapable factor of assessments; the need to leave environmental and living conditions for future generations which are not degraded, in spite of uncertain conditions; the duty to adopt policies which involve and are open to reversible choices, to the future, to the acquisition of new data and new knowledge.

According to Marcel Verweij, mention could probably be made of “obligatory precautions” [103].

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