

tionships. In Buddhist terms this entails critically assessing how and to what extent these values are consonant with the core Buddhist practices of cultivating wisdom, attentive virtuosity, and moral clarity for the purpose of realizing liberating patterns of interdependence.

It generally is agreed among Buddhists that scientific advances in people's understanding of factual processes—for example, the dynamics of climate change—should inform efforts to resolve current and future trouble and suffering sustainably. It also is agreed that scientific and technological research should be undertaken in ways that contribute not only to human welfare but to the welfare of all sentient beings. In combination, these commitments make imperative a deepening of the historically arranged “marriage” of Buddhism, science, and technology and promise an increasingly skillful furthering of the Middle Way.

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SEE ALSO *Bhutan; Chinese Perspectives; Hindu Perspectives; Indian Perspectives; Japanese Perspectives; Virtue Ethics.*

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BUILDING CODES



Building codes are extratechnological laws that govern the design and construction of structures. They can be placed within a hierarchy that begins with metaethics, and includes ethics, laws, codes, ordinances, standards,

and operating practices. A typical code provision is, for example, the government enforced specification that the exterior doors of public buildings must open outward (International Conference of Building Officials [ICBO]), or that the vertical rise of steps and stairs shall not be less than four inches nor more than seven inches (ICBO). These requirements are, however, social rather than technological in origin because they are intended to mediate human behavior in the case of emergencies such as fires in buildings.

In general one can say that building codes both reflect and enforce social values. They are, then, an historical index of how social values regarding the safety, health, and welfare of individuals are materialized as the built world. Because the ethical significance of building codes must be understood within the context of their evolution and development, a historical view of this topic is helpful.

Historical Development

The first building code is generally credited to be Article 229 of the Code of Hammurabi (Mesopotamia, 2250–1780 B.C.E.), which requires that “If a builder build a house for someone, and does not construct it properly, and the house which he built falls in and kill its owner, then that builder shall be put to death.” (Harper 1904, p. 81) The ethical principle behind this code is an *eye for an eye*—the deontic idea that justice is absolute and unchanging, never moderated by local conditions or human situations.

In contrast to such moral absolutism the Greeks, Romans, and early Islamic societies developed more complex or nuanced building codes. These may be said to be of three types: *tacit codes* that regulate cultural production, *legislative codes* that regulate public resources, and *industrial codes* that regulate modern material and labor standards.

Tacit or unspoken codes are those that bind citizens to the customary practices of their community. Anthropologists argue that the way cultures build—what Kenneth Frampton (1995) calls *tectonic culture*—is as important and distinct as the way they speak. Tacit building codes are systems of ordering and inhabiting the world in a manner that is consistent with cosmological order as the community interprets it. To build well means to construct one’s house and dwell righteously—in a manner consistent with divine order (Norberg-Schulz 1979). To depart too far from the tectonic order of one’s culture would be to offend the god(s), or those forces responsible for ordering the universe. Tacit codes are a powerful part of vernacular societies but diminish

in their influence with the self-conscious invention of modern design and construction practices. The ethical principle behind tacit or vernacular building codes is *sin* against divine authority.

Legislative codes are explicit civil laws concerned with maintaining equity and justice between private parties and that guard public resources such as streets against private exploitation or carelessness. Early examples of this type are the Byzantine Roman Treatise of Julian of Ascalon (533 C.E.) and the codes of the Prophet Mohammed during his reign in Medina (622–632 C.E.) (Hakim 1986). These codes make explicit both the rights and obligations of citizens building within previously tacit conventions. A typical example was a law regulating the construction of *party walls*, a single wall that separates and supports two houses. According to architect and planner/historian Besim Hakim, Mohammed said that “a neighbor should not forbid his neighbor to insert wooden beams in his wall” (Hakim 1986, 2003). In the context of desert dwelling, party walls are private resources that enable a public way of life by aggregating individual dwellings into an urban form that shields the community as a whole from inhospitable natural conditions created by too much sun and wind.

The ethical principle that informs these early codes is not, however, conceptually different from those that developed in England on the basis of legislative action, first in 1189 and most significantly in 1676 in response to the great London fire of 1666 (American Institute of Architects [AIA]). These ordinances were principally fire protection measures that ultimately rely upon what nineteenth-century utilitarian philosophers referred to as the *greatest happiness principle*—the notion that right actions are those that cause the greatest amount of happiness and the least amount of pain (Bentham 1962). The conditions of rapid industrialization and urban population growth in mid-nineteenth-century Britain certainly lent urgency to the development of explicit codes that suppressed some individual rights, such as the freedom to construct one’s roof of highly flammable thatch, in the name of the public good. In the view of utilitarian philosophers, principally Jeremy Bentham (1748–1832), such suppression of individual rights was justified for the overall health of the *civic economy*, the ability of the society to provide for the general well being through preventative measures (Chadwick 1965). The greatest happiness principle was quickly expanded in Europe and North America to regulate not only fire, but those unsanitary conditions associated with rapid urbanization and

industrialization that threatened general public health (Melosi 2000).

Industrial codes were developed by government and industry to standardize modern building materials and processes. As new building components such as glass and iron became increasingly available in the late-nineteenth century, it became progressively inconvenient and uneconomical for builders in different locations to employ materials of differing thicknesses, lengths, and strengths. In 1901 the National Bureau of Standards was created by an act of Congress to conduct research and aid small business by creating universal standards of production. In the early-twentieth century, manufacturing organizations, comprised and funded by competing producers such as the American Institute of Steel Construction (AISC, founded in 1921), recognized that it was in their common interests to self-regulate standard measures of size and quality before government did so. Without such standard codes of production, it would be very difficult, for example, to use steel produced in Pittsburgh in a building designed in Chicago to be constructed in San Francisco. Economic and political interests inspire these codes and standards. They are designed to optimize exchange value across political jurisdictions, and are linked to the general process of modernization in which the tacit knowledge of the artisan is supplanted by the formal knowledge of the engineer.

Authorization and Conflict

In the European Union and much of the world, building codes are national and international in scope. This situation has developed from the familiar historical process of modernization. In the United States, however, the legislation of building codes is a state or municipal responsibility resulting in the existence of no fewer than five major building codes and a multiplicity of municipal codes in large cities such as New York.

In 1994 the International Code Council (ICC) was established by the three dominant not-for-profit organizations responsible for the writing of model codes in an attempt to further standardize building codes throughout the Americas. Based near Washington, D. C., the ICC provides a wide range of services to its members through its sixteen regional offices in the United States. Although the ICC's International Building Code (IBC) has been approved for use by forty-four states, individual local jurisdictions are only slowly adopting and enforcing it. This effort may eventually lead to the adoption of a comprehensive building code for the hemisphere, but success will depend upon the speculative possibility of resolving the long-entrenched interests of local indus-

tries, labor unions, architects, and building engineers. Toward this end the ICC has established a quasi-democratic process for code development in which each of the dominant model code groups are equally represented.

Building codes exist within a now complex matrix of legislation from all levels of government. Strictly speaking, building codes regulate only the safety of a building structure, its materials, and the environmental systems that render architecture habitable. They are, however, closely related to other types of codes, such as federal, state, and municipal environmental laws (which regulate emissions and impacts on air, water, and land); zoning ordinances (which regulate such urban concerns as land use, drainage, density, and signage); historic preservation ordinances (which stipulate criteria and processes for mandating the preservation of private property); and design review ordinances (which stipulate criteria and processes for regulating the aesthetic compatibility of new structures in existing districts). These vary significantly from nation to nation, state to state, and city to city.

The social production of codes tends to reinforce the interests of codemakers. Historically the manufacturers of building products and systems such as Willis Carrier (1876–1950), the entrepreneur-developer of modern air conditioning, have competed for control of code making with the publicly employed professionals who now dominate the field. For this reason the authorship of building codes is the principal conflict associated with them. This lingering question fuels conflict between governmental regulators, property owners, and the construction industry. In the social democracies of the European Union or the centrally planned economies of Asia or South America, the property rights of individuals and the technological practices of industry are significantly restricted by a broad definition of the public good. In the United States, however, the public good tends to be narrowly defined through scientific criteria generally limited to human safety and health. Behind these differing approaches to the social construction of building codes is a fundamental question of political trust. In the Netherlands, for example, planners and government technocrats are generally respected and trusted to make decisions that reflect the interests of citizens. In the United States, however, citizens tend to trust the market and their own judgment over that of government. Judged on the criterion of the *sustainable development* of cities (Campbell 1996), Dutch code-makers tend to be more effective than those in the United States because citizens tend to understand building

codes as a moral obligation to fellow citizens rather than as an imposed restriction on individual property rights.

Assessment

The development of tacit, legislative, and industrial building codes was never a simply a matter of economics, science, or ethics. Rather their formulation is a highly social and contentious process through which some interests are suppressed and others reinforced. In theory one may distinguish how a priori economic, scientific, or moral logic might define a building code. In practice, however, these logics are conflated by the social situation—usually a catastrophe—that mandates changed building practices.

Langdon Winner argued that “. . . we do not use technologies so much as live them” (Winner 1997, p. 202). His logic suggests that free democratic societies should promote citizen participation in articulating the technical codes that strongly influence the landscapes of daily life. According to Francis Ventre, “. . .it is the state of knowledge . . . [moral, political, and practical] that drives regulation’s juggernaut. But whose knowledge? The regulatory expansion after the 1920s seems to owe more to a public will rallied and given form by the cultural preferences and superior technical knowledge of articulate minorities who could link that preference and knowledge to wide social concerns” (Ventre 1990, p. 56) Employing similar logic, Andrew Feenberg proposes that the development of technical codes is the discursive process through which societies modify their fundamental values. It is important to recognize that such *civilizational change* is not what economists would call a trade-off in which an economic good is sacrificed for an environmental or public safety good. Rather such revision of technical codes redefines the cultural values within which economic activity takes place (Feenberg). From both an ethical and historical perspective Americans are no more likely to retreat from emerging environmental standards, for example, than from the Americans with Disability Act (1990), the New York City legislation requiring buildings to have fire exits (1860), or the abolition of slavery (1862).

The historical process of regulating how structures are built is indistinguishable from the social process of deciding how human beings will live together—there will be as many building codes as there are distinct societies. This is one reason why the internationalization of building codes, as proposed by the ICC, raises ethical and environmental questions related to technological colonization. The citizens of Mexico, for example, increasingly resist attempts by global institutions to

standardize local building practices that sustain unique cultural practices and ecological conditions. The process of modernization does tend toward the standardization of building codes across countries and continents, but distinct tectonic cultures are not likely to disappear anytime soon. A more important question may be the degree to which citizens of any given society participate in the articulation of building codes, because it is through citizen involvement that government technocrats become accountable for how the community lives, citizens come to trust codemakers, and codes are lived as moral obligations.

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SEE ALSO *Architectural Ethics; Building Destruction and Collapse; Engineering Ethics; Modernization; Science, Technology, and Law.*

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BUILDING DESTRUCTION AND COLLAPSE



Engineers and architects design buildings to stand, and the vast majority of them do so without major incident. Yet occasionally a building does collapse, bringing with it questions about the science, technology, and ethics of structures. Though they happen for a variety of reasons,

collapses can be clustered into three groups: those resulting from natural disasters (earthquakes, mudslides, tornadoes, and the like); inadvertent collapses (because of flaws in design, use, and/or maintenance); and intentional destruction (including both planned demolition and malevolent attacks). Each type raises different, if related, ethical questions.

Two types of explanation exist for collapses. The first is focused on the mechanics or physics of the destruction; it asks what forces were acting on (and being produced by) what parts of the structure and in what fashion. The lessons drawn from such analyses will be, necessarily, structural or mechanical in nature. Mathys Levy and Mario Salvadori (2002), for instance, declare that collapses are always due to structural failure, though this failure may come about in a variety of ways (and, though they do not explicitly say so, may or may not be accidental).

A second type of explanation focuses on what might be termed social—rather than physical—dynamics. Here, the forces are those of the designers and others involved in determining whether and how to erect (or destroy) a structure. Such forces are more difficult to analyze and impossible to quantify, but they are as much a part of building success and failure as are the physical laws that allow them to stand or fall. These two kinds of explanations often have different relative weights in examinations of natural, inadvertent, and intentional destructions.

Natural Disasters

Building destructions caused by natural disasters are the most deadly and devastating kind. The 1923 earthquake near Tokyo, Japan, measured 8.3 on the Richter scale and left 100,000 dead; the 1995 Kobe, Japan, earthquake, rated 7.2, was the costliest ever, causing an estimated US\$150 billion in damage and destroying nearly 100,000 structures. Tornadoes (including the 148 that formed the Super Outbreak of 1974, killing 315) and hurricanes (such as Camille of 1969, which killed 200 and caused billions of dollars in damage) can cause massive devastation as well.

Although the basic cause of the building collapses in these disasters is structural failure (as is true in any collapse), such widespread collapses pose the immediate challenge of disaster response in the face of damaged (or even nonexistent) infrastructure. Is the community able to cope (on its own or with outside assistance) when communication, rescue, and medical systems have been damaged or destroyed?