
SCIENCE AND *LAUDATO SI'* ON THE PARADIGM SHIFT TOWARDS SUSTAINABLE DEVELOPMENT

关于转变模式走向可持续发展的 科学的研究和教宗通谕《愿祢受赞颂》

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ABSTRACT

For sustainability researchers and global policy makers it is lucid clear that a radical turnaround of modern societies is needed to approach sustainable development paths. Pope Francis takes his stand on a basic paradigm shift in his Encyclical Letter *Laudato Si': Care for our Common Home* (2015). He calls for a radical shift of mindsets and ecological and cultural conversion which are needed for sustainability and a life in dignity for all. The author compares aspects from sustainability research and *Laudato Si'* and shows how science and Francis spiritual-theological take converge. Both call for the need of new mindsets and spiritual resources to nourish just life-styles and sustainable societies.

A global transformation towards sustainable societies is as urgent as it is wanting. But recently there seems to be a start in the right direction. In 2015 *The 2030 Agenda for Sustainable Development* with its 17 Sustainable Development Goals (SDGs) was adopted at the UN in New York and the COP21 Paris Agreement was established within the UN Framework Convention on Climate Change (UNFCCC). In June 2015, Pope Francis published his encyclical letter *Laudato Si': Care for our Common Home*. These documents reveal the immense complexity of the transformation from a consumerist

society to a sustainable society. More researchers acknowledge the need to engage religious and spiritual resources to shape worldviews in favour of sustainable development (Gardner, 2010; Gerten & Bergman, 2012; Banse, Nelson & Parodi, 2011; Thomas, 2011).

Already as Archbishop of Buenos Aires, Francis had encouraged *cartoneros* and *recicladores* in their recycling efforts, “because what is leftover is rich” (Francis, 2013). Once elected Pope, Francis used his pulpit to challenge the legitimacy of political and economic systems that not only pollute, but also exclude the poor and the marginalised through indifference to their needs. The following contribution reflects on selected elements of the Encyclical Letter *Laudato Si'* by relating them to insights from sustainability research, that in principle confirm Francis' push for an ecological conversion. Religion and science here converge on the necessity of a “bold cultural revolution” (Francis, 2015a, sec. 114) to reach a just and sustainable development path.

RESPECTING PLANETARY BOUNDARIES AND GUARD RAILS

Human societies have to learn to comply with natural limits conceived as “planetary boundaries and guard rails” (WBGU = German Advisory Council on Global Change, 2014; Jackson 2009). The core message of the COP21 Agreement sets a limit to an increase in global temperature of 2°C, or better 1.5°C, for human induced atmospheric warming and the emissions contributing to it. Accepting such a limit is not new. Many material resources and precious rare earths are limited and shared with present and future generations. One practical consequence of respecting limits is to understand interconnectedness, e.g. of social and ecological issues, or of present and future generations, leading us to acknowledge the preciousness of biological and cultural diversity so that they can be preserved and protected. Goal 15 of the United Nations SDGs of 2015 demands the halting of losses in biodiversity (BD) so crucial for stability in nature and societies and specifically for the future of indigenous populations. The current dramatic loss of BD is due to a failure to acknowledge interconnectedness with the resulting

lack of coherent policies to set appropriate limits. Policymakers and administrative departments face huge challenges to acknowledge interdependencies of everything with everything (Francis, 2015a, sec. 70; sec. 137ff.) and implement coherent policies.

In *Laudato Si'* Francis puts a strong focus on biodiversity (sec. 32ff.) and emphasises the “mutual connections in an ordered system” with everything “dependent on one another” (sec. 42). Loss of biodiversity, land degradation, soil and water pollution, ocean acidification, marine litter, global warming and the waste of resources and energy are systemically interconnected. For Francis the “Cry of the Poor” and the “Cry of the Earth”, the social and ecological dimension, are deeply interwoven, revealing that “contrary to what some have claimed, it is not the mass of poor people that destroy the planet, but the consumption of the rich. Global warming is the consequence of this development of a few and will affect everyone but brings devastation especially to the weakest in society” (Schellnhuber, 2015, p. 3). As *Laudato Si'* declares, the developed countries are socially in debt towards the poor which must be factored into any solutions to the crisis over climate change.

Indigenous cultural communities live at the interface of biological and cultural diversity. The cultural riches of peoples, “their art and poetry, their interior life and spirituality” needs to be protected and preserved (sec. 62f.). Francis calls for a “bold cultural revolution” (sec. 114), because “the disappearance of a culture can be just as serious, or even more serious, than the disappearance of a species of plant or animal. The imposition of a dominant lifestyle linked to a single form of production can be just as harmful as the altering of ecosystems” (sec. 145).

CULTURAL TRANSFORMATION TOWARDS SUSTAINABLE LIFESTYLES

For Francis the current economic process of design, production, and consumption in most developed countries is still based on a “throwaway culture” (sec. 22), which is well documented in scientific studies: “The consumption decision and lifestyles of the middle and upper classes are currently making the biggest contribution to

the causes of global environmental problems." (WBGU 2014: 3). Research on household consumption in Finland mapping a vision for 2050 reveals that material resource use needs to be cut by a factor of five, from currently 40 tons to eight tons per person a year (Lettenmeier, Liedtke & Rohn, 2014; Bringezu, 2015). According to the

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authors of the Finnish study, there is a "long way to go and a lot of effort required" to meet these goals to achieve a reduction in material resource use and they see an "enormous transformation task" ahead.

One indication of the extent of the challenge is the dramatic increase in e-waste, the electronic waste in the form of discarded electrical or electronic devices. In 2016 there were globally 44.7 million tons (Mt) of e-waste, with only 20 percent (8.9 Mt) of e-waste being collected and properly recycled, resulting in 80 percent (35.8 Mt) of e-waste being not documented (Baldé et al., 2016). This entails enormous environmental, social and political implications, as scarce conflict materials are crucial for the production of electronic equipment. "The total value of all raw materials present in e-waste is estimated at approximately 55 billion euros in 2016, which is more than the 2016 Gross Domestic Product of most countries in the world" (Baldé et al., 2016). As Robertson (2014) points out:

Up to 80 percent of America's electronic waste is exported to developing countries, where environmental and worker protection laws and enforcement are

less strict.... Low-wage workers without protective gear, including children, burn components, soak them in acid baths to separate small amounts of resalable materials, breathe dioxin-filled smoke, and disassemble lead- and mercury-laden parts with their hands. Contaminated water is poured into lakes and rivers and contaminated solid waste is dumped in huge piles near villages, where toxins continue to leak into the soil and water supply. (pp. 276-77)

Laudato Si' clearly warns of the injustices involved in the export of "solid waste and toxic liquids to developing countries" (sec. 51). Francis calls for a radical turnaround and ecological conversion, indeed a deep "change of humanity" (sec. 9 & 13), of policies and lifestyles, from unsustainable to "prophetic" and sustainable (sec. 222).

RESOURCE RESPONSIBILITY AND STRICT APPLICATION OF THE WASTE HIERARCHY

The current waste in resources and energy is driven by linear end-of-pipe systems of production and consumption, meaning that goods are produced and services delivered with a lack of accounting for due costs and consequences or considering proper reuse or recycling possibilities. The "throwaway culture" results in the overuse and waste of natural resources, leading to the blurring, if not the violation, of some planetary boundaries. A new vision and thinking is required for managing natural resources, based on much needed resource ethics supporting a strict implementation of the "waste hierarchy".

Waste hierarchy is a normative principle that prioritises integrated resource and waste management in view of environmental responsibility. The goal is an "absolute reduction in the consumption of resources to sustainable levels, based on reliable measurement of resource consumption throughout the supply chain, strict application of the waste hierarchy...creating a closed loop on non-renewable resources" (European Parliament 2015, sec. 16). Waste Hierarchy asserts that Not Producing (Waste

Prevention) comes before Minimisation and Reusing, as the latter have a higher level of resource use and emission impact. Reusing comes before Recycling, as the latter can demand “lengthy transport with additional energy consumption and greenhouse gas emissions. While there are energy savings in recycling, it still consumes more energy than either reusing a product or not producing it in the first place” (Robertson, 2014, p. 275). A blind focus on recycling can lead to more consumption and can inhibit necessary systemic changes:

Recycling often has the effect of encouraging even greater consumption, known as the rebound effect. Consumers seeing the recycling symbol on a plastic container may assume that consuming the product is without environmental costs and may feel that consuming and discarding are environmentally-responsible actions. Recycling may point us in the wrong direction and distract us from more efficient and fundamental changes. (Robertson, 2014, pp. 275-76)

Nevertheless, in some cases, such as the use of aluminium cans, recycling is a must. “Virgin aluminium contains an extremely large amount of embodied energy; recycled aluminium can save 75 to 96 percent of that energy” (Robertson, 201, p. 277). Despite its limits, one of the greatest benefits of recycling is raising ecological awareness:

Using recycled materials in manufacturing almost always uses less water and energy, releases less pollution, and emits less carbon dioxide than manufacturing with virgin materials. In addition, perhaps one of the greatest benefits of recycling has been its effect on public awareness of environmental issues. Recycling is the first contact many people have with issues of planetary health and the connection between their own actions and the environment. (Robertson, 2014, p. 275)

The waste hierarchy suggests that energy recovery through the incineration and disposal of waste at landfills are at the lowest level and should be phased out in the long run. As Robertson points out: “In addition to having concerns about health risks, some organizations object on the basis of environmental justice since incinerators are usually built in low-income communities” (p.272).

The implementation of the waste hierarchy principle requires consistent policies and incentives. “Rather than a single monthly fee, users are charged based on the volume they discard, an approach sometimes known as pay-as-you-throw. Some regions have taken money that would have been spent on landfills or incinerators and instead have invested in infrastructure that supports reuse” (p. 281). Overall, a change of mentality and thinking is crucial towards a zero-waste system:

Zero Waste involves rethinking the entire production and wasting system. This approach considers the entire life cycle of a product when analyzing its costs. It stresses prevention, recognizing that it is more efficient and healthier to prevent waste formation in the first place than to treat waste after it has formed. At its core, Zero Waste acknowledges that humans are part of the natural world. It aims for cradle-to-cradle, closed-loop cycling of non-toxic matter that will allow the biosphere in which we are embedded to continue intact into the future. (Robertson, 2014, pp. 281-282)

Robertson’s perspective confirms what Pope Francis writes in *Laudato Si’* regarding waste prevention (sec. 22 & 113), repairing (sec. 192 & 211) and recycling. The exploitation of the resources of our common home “has exceeded unacceptable limits” (sec. 11). Thus, we have to overcome the culture of wasting and discarding in “wasteful cities” (sec. 44). Vehemently Francis calls for “less waste” (sec. 129) and a termination of the throwaway culture violating the dignity of the world.

THE SUSTAINABILITY STRATEGY *EFFICIENCY- CONSISTENCY-SUFFICIENCY*

Sustainability research suggests integrating the principles *efficiency*, *consistency*, and *sufficiency* to reach a sustainable development path (Secretariat of the German Bishops' Conference 2011; Samadi, Gröne, Schneidewind, Luhmann, Venjakob, & Best 2017). Efficiency means to save resources and energy through technological innovation. But higher efficiency is not enough for sustainable development because of the direct and indirect rebound or "boomerang effects" of consumption patterns. This means that gains in efficiency, such as using a more fuel-efficient car, are often eaten up by *more* (direct rebound) and *new* (indirect rebound) forms of consumption. For example, the fuel efficiency of cars increased in the US by 40 percent since 1980, but fuel consumption per vehicle "remained constant since 1980 due to more driving and more (and larger) vehicles." (Schor 2011, p. 90). An example for an indirect rebound effect is to use efficiency gains to switch to new forms of transportation such as increased air travel, which impose their own environmental costs. Francis agrees that technology alone (efficiency) will not lead to a sustainable path (Francis 2015a, sec. 20). Changes in societies (consistency) and on the personal level (sufficiency) are needed. Consistency requires building innovative systems of production and consumption. This could be the creation of effective public transport or car-sharing systems instead of running private vehicles in cities, or creating a consistent integrated resource and waste management system instead of the current throwaway system, which only compounds the ecological problems of waste disposal and pollution and also social justice. Consistency favors a circular economy with zero-waste policies, which internalise the costs of externalities, as in a plastic bag levy or a carbon tax. This is the *True-Cost-Principle* (German: *Kostenwahrheit*) that Pope Benedict XVI encouraged:

To make every effort to ensure that the economic and social costs of using up shared

environmental resources are recognized with transparency and fully borne by those who incur them, not by other peoples or future generations. (Benedict XVI 2009, sec. 50)

Inconsistent externalization policies and practices ("others should pay") have to be phased out in favour of the *User- or Thrower-Pays-Principle*, such as through policies promoting the Extended Producer Responsibility (EPR), as well as governmental regulations that require shops to take back toxic printer cartridges, or to contribute to a fund for circular and recycling systems of resources.

Resources are often used inefficiently because the information about the true costs to society of consuming them is not available, with the result that businesses and individuals cannot adapt their behavior accordingly. Policy measures to improve resource efficiency and overall economic competitiveness must place greater emphasis on 'getting prices right' and making them transparent to consumers, for instance in transport, energy and water usage, so that prices reflect the full costs of resource use to society (e.g. in terms of environment and health), and do not create perverse incentives. In this respect, information and communication technologies can play a decisive role through, for instance, smart metering. (EU-Commission 2011, p. 7)

However indispensable, higher *efficiency* backed by more *consistent* systems is not enough to reach a sustainable development path. Sustainability research speaks of the need for *sufficiency* in addition to efficiency and consistency (Princen, 2005; Samadi et al., 2017). "Sufficiency and changes in lifestyle should rather be embedded, discussed and quantified independently of technology decisions." (Samadi et al. 2017, p. 132). Sufficiency means accepting and living within life-giving limits; for example,

reducing food loss and waste - on the institutional and personal level - or observing at least one meatless day a week. Sufficiency requires a change of mindsets and new orientation, spiritual values (Francis 2015a, sec. 222), including the cultivation of a "capacity for contemplation and reverence" (sec. 127 & 237). A core message of *Laudato Si'* is that spiritual values like mindfulness, thankfulness, tenderness, and respect are crucial in overcoming the throw-away mentality and achieving sustainable development in our common home. This is fully in line with research on sustainability and ethics of responsible consumption. (Crocker 1998; Reisch, 2004; Schor 2011). One practical example is here the Slow-Food-Movement of Carlo Petrini.

SPIRITUALITY FOR SUFFICIENT AND SUSTAINABLE LIFE-STYLES

Francis puts the question of justice squarely in the forefront of the quest for sustainability: "Whenever food is thrown out it is as if it were stolen from the table of the poor" (sec. 50). Globally, "roughly one third of the food produced in the world for human consumption every year — approximately 1.3 billion tons — gets lost or wasted." (FAO 2013). Food loss and waste is a burning question of social and ecological justice. If food waste were measured as if it were a country all its own, it would be the third largest emitter of CO₂ equivalents after China and the USA (Jones, 2015). In 2011, Hong Kong produced 3,600 tons of food waste per day, coming from supermarkets, restaurants, hotels, and households, amounting to approximately 40 percent of the city's solid waste. When food is wasted, the land, water, fertilizer and labour needed to grow that food are also wasted. (Environmental Protection Bureau Hong Kong, 2013). The Campaign Foodwise Hong Kong is a laudable initiative to raise awareness on various societal levels. But this issue needs also systemic and structural answers, and a change of mindset on the spiritual level. Many countries have food banks so that supermarkets and hotels can donate surplus food for poor and needy communities. Such initiatives may require also a proper legislation, information, and institutions.

(Schneider 2013). But there is also the need of spiritual support, as Norman Wirzba describes when referring to eating and fasting, so basic in most spiritual and religious traditions:

Feasting and fasting are two primary ways we enact relationships. How we eat, what we eat, and how much, demonstrate what we think our responsibilities to each other and the world should be. People who fast, learn food is a gift and is not to be taken for granted or exploited. [...] When we fast we learn that too much of the time personal life is marked by an aggressive or rapacious disposition (which is why we might develop a gentler ego and a calmer gait). When we fast, we learn that in many of our actions we presume that the world's gifts exist for our own exclusive enjoyment (hence the need to tame the greed and develop the restraint that are at the basis of all just relationships). Fasting, in other words, leads us to a realization about the responsibilities of life together. When we refrain from eating, we not only demonstrate solidarity with those who do not have food to eat but we also demonstrate that food is the precious gift of a self-giving God. [...] Fasting, in its most fundamental aspiration, is about developing a sacrificial, self-offering life that addresses and nurtures the needs of others. (2011, pp.141 ff.)

Pope Francis advocates such a spirituality of respect, tenderness, justice, and interconnectedness, when he tells us: "What is leftover is rich!" Science as well as enlightened public policy and environmental activism, as we have seen, converge with main messages of *Laudato Si'*. May it guide us spiritually, as we seek to transform our life-styles and societies to become more just and sustainable in our common home.

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