

new sensors as technology advances in the future finally the building stays warm by pumping down warm water in the summer months almost 400 feet into the aquifer below it sits it insulated into the winter when it is sucked back out for heating our planning to build a lot more buildings like these and the next one will be smarter and the one after that will be smarter as well and we won't stop until all cities in the world are filled with buildings that are intelligent and that are not using any energy anymore

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tables affecting both human use and ecosystem health (Cuoco et al. 2015). Furthermore the extraction process can disrupt the natural balance of aquatic ecosystems leading to biodiversity loss and habitat degradation (van Engelenburg et al. 2018). In addition the extraction process affects the quantity and quality of water available in local streams and rivers. Reduced water flow can lead to higher concentrations of pollutants and increased water temperatures adversely affecting aquatic life. Lower water tables can result in reduced soil moisture impacting local agriculture and vegetation (Bartolini et al. 2007; Ferragina 2010). The ecological consequences of water extraction are further compounded by the reduced ability of the environment to recharge depleted aquifers. Natural recharge processes are often slower than the extraction rate leading to long-term sustainability issues. Over time this imbalance can result in permanent changes to the local ecosystem including the loss of biodiversity and the degradation of natural habitats (van Engelenburg et al. 2018).

Social Impacts
 The social impacts of water bottling operations are significant affecting local communities in various ways. One of the most pressing social issues is the reduced access to water for local communities. As companies like Sanpellegrino extract vast quantities of water local residents often find their wells drying up or experiencing reduced water pressure. This can lead to conflicts over water use particularly in regions where water is already scarce (Ostrom 1998). While the water bottling industry generates substantial revenue the economic benefits often do not extend to local populations. Residents may face increased costs for water and might need to purchase bottled water for their own use effectively buying back their own resources at a premium price (Manzella et al. 2018). Reduced water availability has significant health implications. Lower water quality can lead to a higher incidence of waterborne diseases impacting public health. Additionally reduced water availability affects agriculture a primary livelihood for many residents. Farmers may experience lower crop yields and increased difficulty maintaining livestock further exacerbating economic inequalities (D'ippoliti et al. 2015).

Economic Impacts
 The economic impacts of the water bottling industry present a complex picture of benefits and costs (Bartolini et al. 2007). While the industry contributes to national economies by generating substantial revenue through taxes and employment it also incurs external costs related to environmental degradation and social issues (Bartolini et al. 2007; Sanpellegrino 2023). For instance Sanpellegrino a major player in the industry reported revenues of over one billion Euros in 2022 significantly contributing to local and national economies (Sanpellegrino 2023). Moreover the bottling industry provides stable employment opportunities which can significantly benefit regions with limited job prospects. Sanpellegrino alone employs thousands of workers in its facilities and Bartolini et al. (2007) underscored the far-reaching effects of such employment opportunities. The study highlighted the positive implications of stable job opportunities provided by companies like Sanpellegrino supporting individuals and families with reliable incomes and stimulating local economic activity through increased consumer spending investment and tax revenues (Bartolini et al. 2007). However external costs such as environmental degradation and social costs are not typically accounted for in the industry's economic benefits. Local governments may incur additional expenses in managing water resources addressing health impacts and mitigating environmental damage caused by over-extraction (Cuoco et al. 2015). Such realities highlight the need to comprehensively assess the water bottling industry's economic impacts considering its benefits and external costs.

Regulatory Frameworks and Policy Analysis
 The

regulatory landscape in Italy and the European Union is oriented towards the sustainable management of water resources. However there is a need for greater consistency in enforcement and effectiveness. Current legislation and policies often prioritize corporate interests over public and environmental health. For instance while regulations such as the Water Framework Directive (Directive 2000/60/EC) aim to safeguard water resources and foster sustainable water management practices there are discernible inconsistencies in enforcement and regulatory gaps that have the potential to compromise these objectives thus enabling companies like Sanpellegrino to continue extracting water at unsustainable rates (Aukidy et al. 2012).

To address these challenges it is essential to introduce more stringent regulatory measures. This could involve the implementation of tighter water extraction limits and the enforcement of compliance through regular monitoring consequently contributing to the protection of water resources. Furthermore the involvement of local communities in decision-making processes concerning water resource management is crucial as it ensures that their needs and rights are duly considered (Bartolini et al. 2007). If meticulously employed these approaches may prove instrumental in amplifying the efficacy of existing regulations and driving meaningful change in the sustainable management of water resources within Italy and the European Union.

Recommendations for Sustainable Practices

A comprehensive strategy is essential to address the significant environmental impacts associated with the water bottling industry. Firstly as previously discussed stricter regulatory measures are necessary to mitigate these impacts. This entails imposing more rigorous limits on water extraction and ensuring compliance through continuous monitoring (Spiliotopoulou & Roseland 2020). These regulations should be based on scientific evaluations of sustainable extraction rates.

Secondly community engagement in decision-making processes related to water resource management is crucial. As proposed by Spiliotopoulou and Roseland (2020) and grounded in the principles of Ostrom (1998) community-based water management models have been shown to balance corporate interests and public needs effectively. A more equitable distribution of resources can be achieved by actively involving residents businesses and other stakeholders in water management decisions.

Thirdly companies should invest significantly in conservation technologies including developing methods for recycling and reusing water within bottling plants. This approach can reduce water usage and enhance the efficiency of water extraction processes (Spiliotopoulou & Roseland 2020). The incorporation of these advanced technologies not only demonstrates a commitment to sustainable practices but also aligns with the growing societal and environmental expectations for corporate responsibility and stewardship. Therefore companies that invest in these conservation technologies are better positioned to minimize their environmental footprint and positively impact their operational costs and long-term sustainability.

Furthermore corporate environmental responsibility initiatives must be prioritized within the business world. Companies like Sanpellegrino must lead in promoting environmental sustainability and social equity. For example they could consider allocating resources to funding local water conservation projects and supporting infrastructure improvements (Bae & Kim 2022). This kind of proactive approach not only benefits the environment but also positively impacts the communities in which these companies operate.

Employing a multi-faceted approach to address environmental impacts by implementing rigorous regulations engaging with communities fostering technological innovation and promoting corporate responsibility initiatives is paramount (Spiliotopoulou & Roseland 2020; McNabb 2019; Bae & Kim 2022). This approach can substantially contribute to the

sustainable management of water resources advocating for environmental sustainability and social equity. Additionally analyzing the water bottling industry's environmental social and economic impacts highlights the broader implications of treating water as a commercial commodity. By reorienting the management of water resources to prioritize sustainability and equity we can ensure the long-term health of both the environment and local communities. Achieving this objective requires a collaborative effort among corporations governments and communities to develop and implement strategies that harmonize economic benefits with environmental and social responsibilities.

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this lecture is on open-loop versus\n00:00:02.700 closed-loop control systems a
control\n00:00:05.370 system is a mechanism that alters the\n00:00:07.440 future
behavior or state of a system now\n00:00:11.490 in order to be considered a
control\n00:00:13.230 system and not simply a change the state\n00:00:16.139 system
the behavior or the outcome must\n00:00:19.260 tend towards a state that is
desired\n00:00:21.830 control theory is a branch of\n00:00:24.570 mathematics that is
concerned with the\n00:00:26.430 strategy to select the appropriate
input\n00:00:28.949 or to put it another way it deals with\n00:00:32.070 how to go
about generating that outcome\n00:00:36.469 without control Theory the designer
is\n00:00:39.809 relegated to selecting appropriate\n00:00:41.780 actions through
trial and error\n00:00:45.320 now all control systems have two basic\n00:00:48.210
parts the system to be controlled\n00:00:49.860 usually called the plant and an
input\n00:00:52.559 into the plant the input acts on the\n00:00:55.680 plant which
responds over time to\n00:00:57.570 produce a system output this type of\n00:00:59.969
control system is called an open-loop\n00:01:01.949 system because the input does not
depend\n00:01:04.799 on the system output open-loop control\n00:01:08.070 systems are
typically reserved for\n00:01:09.659 simple processes that have well-
defined\n00:01:12.090 input output behaviors for example a\n00:01:15.030 dishwasher is
an open-loop control\n00:01:17.189 system the goal of a dishwasher which
is\n00:01:20.460 the plant is clean dishes which is the\n00:01:22.920 output once the
user sets the wash time\n00:01:26.070 which controls the time to clean
the\n00:01:28.350 dishes the dishwasher will run for that\n00:01:31.409 set time now
this is true regardless of\n00:01:34.500 the cleanliness of the dishes if
the\n00:01:37.200 dish is loaded were clean to begin with\n00:01:39.150 the dishwasher
would still run for the\n00:01:40.920 prescribed time further if you
loaded\n00:01:43.619 the dishwasher with ten plates full of\n00:01:45.630 cake the set
time might not be enough to\n00:01:48.119 clean them another common example
of\n00:01:51.689 open-loop control is a sprinkler system\n00:01:54.000 for your lawn
in this control system the\n00:01:59.189 system output is the moisture content
of\n00:02:01.710 the soil again the user sets the timer\n00:02:05.939 which controls
the amount of time to run\n00:02:08.128 the sprinklers and while the
sprinklers\n00:02:10.139 are running the plant which is the grass\n00:02:11.910 in
this case is being\n00:02:13.230 water&#x27;d again an open-loop
sprinkler\n00:02:16.379 system would still run even if it was\n00:02:18.180 raining
outside for a more complicated\n00:02:20.549 example imagine trying to obtain
a\n00:02:23.129 constant speed in your car without the\n00:02:25.530 benefit of the

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built-in automatic cruise control to do this you went to Rod between the front of your seat and the gas pedal to depress it halfway down the output of the control system is the speed of the car and the input is the position of the gas pedal again the car itself is the plant the car begins to accelerate down a flat road until the force applied to the system is balanced by the force of friction at this point the car stops accelerating and maintains a constant speed but what happens when the car encounters a hill or a Valley without varying the input that is adjusting the gas pedal the car will slow down or speed up and the desired constant speed will not be maintained this is the primary drawback to open-loop control the input to the system has no way to compensate for variations in the system now to account for these changes you must vary the input to your system with respect to the output and this type of control system is called a closed loop control system now in addition to calling a closed loop control this can also be referred to as feedback control negative feedback control or automatic control for the time being we'll use these terms interchangeably although there are slight variations between some of them that we won't address in this lecture in closed loop control you measure the output of the system with a sensor and compare the result against a reference signal often this is referred to as the desired state or the commanded state an error term is generated and then fed through a controller where the error is converted into a system input value when drawn in block diagram form it's easy to see why this is referred to as a control loop the negative part of the negative feedback control term is based on the comparator juncture where the feedback is subtracted so how does feedback control work in practice well let's take the case of the dishwasher there could be a sensor that measures the cleanliness of the plates the reference signal would be some sort of desired cleanliness level that would be set either by the manufacturer or by the user this desired cleanliness level would be compared to the measured level an error term would be generated which would be fed through a controller which would monitor when to shut off the dishwasher a sprinkler system could also benefit from closed-loop control the sensor could be a device planted in the soil that measures the moisture content of the plant remember that in this case the plant is both the grass and the soil the reference signal would be a desired soil moisture content and again the error signal would be generated which would then be fed through a controller and the controller would adjust the amount of time that the sprinklers ran the sprinklers would then run until the moisture level reached a specified value and then they would be shut off for the car with cruise

control\n00:05:23.320 closed-loop control would work something\n00:05:25.400 like this\n00:05:27.040 the sensor is a speedometer which\n00:05:30.229 measures the speed of the car the\n00:05:32.870 reference speed would be the speed that\n00:05:34.789 the car was going when the cruise\n00:05:36.830 control was set now assume that the car\n00:05:41.150 starts in a steady-state position on\n00:05:43.220 flat road and what I mean by that is\n00:05:45.800 that the speed is constant at your\n00:05:47.479 desired speed and also that the gas\n00:05:49.820 pedal is depressed the amount needed to\n00:05:52.550 generate that speed for this example\n00:05:55.400 let's say the desired speed is a hundred\n00:05:57.470 miles per hour\n00:05:58.400 therefore the speedometer would also\n00:06:00.139 read a hundred miles per hour and since\n00:06:02.479 the measured speed exactly matches the\n00:06:04.250 reference be the error term is zero the\n00:06:07.190 gas pedal would stay exactly where it is\n00:06:08.690 once the car encounters the hill the\n00:06:11.150 speed starts to slow\n00:06:12.440 now the reference speed is greater than\n00:06:14.180 the measured speed and the error term\n00:06:15.800 becomes positive which signals the\n00:06:17.510 controller to speed up if the car\n00:06:20.060 encounters are downhill the speed will\n00:06:21.560 increase now the reference speed is less\n00:06:23.990 than the measured speed and the error\n00:06:25.550 term will be negative the beauty of the\n00:06:27.979 feedback control system is that it is\n00:06:29.389 capable of reacting to changes to the\n00:06:31.190 plant automatically by constantly\n00:06:32.990 driving the error term to zero I want to\n00:06:36.169 leave you with one more thought\n00:06:37.250 regarding closed-loop control if we take\n00:06:40.550 a block diagram and assign letters that\n00:06:43.190 abstractly represent the various parts\n00:06:45.590 of a control system we can gain new\n00:06:47.750 insight into how feedback control is\n00:06:50.260 manipulating a system for example if we\n00:06:53.570 label the reference signal V and we call\n00:06:56.389 the controller some abstract process D \n00:06:58.699 through the plant G which produces an\n00:07:00.979 output we'll call Y which can be fed\n00:07:03.110 back through the sensor H to generate an\n00:07:05.060 error term e we can then reduce this\n00:07:08.030 block diagram even further for example\n00:07:11.570 we can multiply D and G to combine into\n00:07:14.090 a single block to reduce further however\n00:07:17.060 takes a small amount of algebra the\n00:07:19.400 error signal is the reference signal V \n00:07:21.889 minus the output Y times the sensor\n00:07:24.590 process H the output Y is the error term\n00:07:27.800 times D times G now solve this equation\n00:07:31.700 for e which will give you Y over DG \n00:07:34.790 now you can set both equations equal to\n00:07:37.520 each other and through a few more\n00:07:39.830 algebraic steps you can solve for the\n00:07:42.260 variable Y with respect to V and since Y \n00:07:48.080 is the output and V is the input the\n00:07:50.720 rest of that equation is what we refer\n00:07:52.370 to as a transfer function of the system\n00:07:54.830 in this case the transfer function is d \n00:07:59.540 times G over 1 plus DGH and for those\n00:08:04.160 who are paying attention you'll notice\n00:08:05.510 that I forgot to write the V at the end\n00:08:07.550 of that equation there we can now\n00:08:11.360 rewrite this back in block diagram form\n00:08:13.490 these two block diagram representations\n00:08:15.620 are equivalent of each other now doesn't\n00:08:17.660 this new process look a lot like an\n00:08:19.370 open-loop control system only with a\n00:08:21.350 modified plant the feedback path has\n00:08:23.660 altered the original plant to be\n00:08:25.010 something new and furthermore the\n00:08:26.810 open-loop behavior of this new plant has\n00:08:28.670

the exact characteristics we wanted from the original plant namely that it follows our input now here's something to ponder until the next video what are the limitations of feedback control in other words can we make any plant behave like anything we choose just by adding a feedback control system which is made up of a controller D and a sensor H one other thing do you think in our car example from up above by using feedback control we can turn a Pinto into a Ferrari just by applying more gas we'll discuss that in a future video

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                  "Here's a script for a video recorded speech you might use, as the newly appointed CEO of Sanpellegrino, to convince the Board of Directors at X-Corp to adopt more sustainable industry practices. This speech integrates details from the initial assignment part as well as introduces models and initiatives for sustainability.\n\n---\n\n**[Opening Scene: CEO standing in a conference room with a large screen displaying the Sanpellegrino logo]**\n\n**CEO:**\n\"Good morning, esteemed members of the Board. As your new CEO, my priority is to ensure Sanpellegrino not only leads in market share but also in sustainability within the bottled water industry. Today, I want to discuss how our current practices are unsustainable and present a comprehensive plan to pivot towards sustainability.\n\n**[Slide Change: Image of depleting water sources]**\n\nFirst, let's consider our impact on natural resources. We draw significant volumes of water from natural springs, a practice that has led to reduced local water tables and increased environmental degradation. Our extraction rates are currently outpacing natural replenishment, posing risks to local ecosystems and communities who depend on these water sources.\n\n**[Slide Change: Economic and Social Impact Data]**\n\nEconomically, while we've seen over one billion Euros in revenue, the external costs of environmental degradation, community displacement,

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and water scarcity\u2014are mounting. Socially, our operations have led to conflicts over water use, affecting local livelihoods and causing public health issues due to reduced water quality.\n\n**[Slide Change: Closed-Loop System Model]**\n\nTo address these challenges, I propose we transition to a closed-loop water management system. This model will reduce our reliance on single-use water sources, implement recycling and purification technologies, and ensure sustainable water use without depleting community resources.\n\n**[Slide Change: Life Cycle Assessment Model]**\n\nHere's our life cycle sustainability assessment. By optimizing every stage\u2014from water extraction to bottling\u2014we can significantly reduce our environmental footprint. This includes using renewable energy sources in production and enhancing our packaging process to minimize waste.\n\n**[Slide Change: Five Sustainability Initiatives]**\n\nI propose the following initiatives:\n1. **Reduce water extraction by 25%** over the next five years through improved efficiency and alternative sources.\n2. **Invest in water recycling technologies** to treat and reuse wastewater.\n3. **Launch a community engagement program** to ensure local communities benefit directly from our operations.\n4. **Implement a renewable energy transition plan** for all our facilities by 2030.\n5. **Enhance our product lifecycle management** to reduce and eventually eliminate our reliance on single-use plastics.\n\n**[Slide Change: Quantified Outcomes and Targets]**\n\nAdopting these measures will:\n- Decrease water extraction from critical habitats by 40%.\n- Reduce greenhouse gas emissions by 30% across all operations.\n- Achieve a 50% reduction in waste through recycling and reusing initiatives.\n\n**[Final Slide: Call to Action]**\n\nIn conclusion, shifting to sustainable practices is not just an environmental or social imperative but a strategic business decision. It will safeguard our resources, enhance our brand reputation, and ensure long-term profitability. I ask for your support to implement these initiatives, ensuring Sanpellegrino's leadership in sustainability and responsible resource management.\n\nThank you for your attention. I am now open to any questions or suggestions you might have.\n\n**[End Scene: CEO nods respectfully, awaiting feedback]**\n\n---\n\nThis script uses data from your previous assignment to argue the business case for sustainability, backed by specific models and quantifiable targets to ensure it meets the board's expectations and aligns with corporate goals.]], "status": "finished_successfully", "end_turn": true, "weight": 1.0, "metadata": {"citations": [], "gizmo_id": null, "finish_details": {"type": "stop", "stop_tokens": [100260]}, "is_complete": true, "message_type": null, "model_slug": "gpt-4", "default_model_slug": "gpt-4", "pad": "AAAAAAAAAAAAAAAAAAAAAAAA", "parent_id": "cf08915a-daff-44f6-8e38-41465ade7e97", "request_id": "890dbel6a9a983b4-MXP", "timestamp": "absolute", "recipient": "all", "channel": null, "parent": "cf08915a-daff-44f6-8e38-41465ade7e97", "children": [{"id": "aaa2c29f-4cd6-474e-a094-1276a9bce9ca"}], "aaa2c29f-4cd6-474e-a094-1276a9bce9ca": {"id": "aaa2c29f-4cd6-474e-a094-1276a9bce9ca", "message": {"id": "aaa2c29f-4cd6-474e-a094-1276a9bce9ca", "author": {"role": "user", "name": null, "metadata": {}}, "create_time": 1717900833.421737, "update_time": null, "content": {"content_type": "text", "parts": ["Can you produce a short lifecycle assessment model for San PELLEGRINO BASED ON THE ATTACHMENTS"]}, "status": "finished_successfully", "end_turn": null, "weight": 1.0, "metadata": {"attachments": [{"id": "file-cX1fGstFnGaKrmfRZ0rPGWic", "size": 2812584, "name": "10papers8.pdf", "mime_type": "application/pdf", "file_token_size": 81464}, {"id": "file-jelGc3ciThgMy40cKtM8dFDp", "size": 9538089, "name": "ENGL_Sanpellegrino Bilancio Sostenibilit\u00e0 2023_def_LR.pdf", "mime_type": "application/pdf", "file_token_size": 100473}, {"id":

"file-R5OSTQphu5vMdCpOZ04ALvLO", "size": 908286, "name": "Week 4_Systems Thinking for Life Cycle Sustainability Assessment.pdf", "mime_type": "application/pdf", "file_token_size": 45889}], "request_id": "890dcleeded65249-MXP", "message_source": null, "timestamp_": "absolute", "message_type": null, "recipient": "all", "channel": null, "parent": "8aba1878-3dc9-4c19-8f8e-82f2816e6600", "children": ["d0ee00d0-e182-4eeb-bb22-cb0cc1993f9a"], "d0ee00d0-e182-4eeb-bb22-cb0cc1993f9a": {"id": "d0ee00d0-e182-4eeb-bb22-cb0cc1993f9a", "message": {"id": "d0ee00d0-e182-4eeb-bb22-cb0cc1993f9a", "author": {"role": "tool", "name": "myfiles_browser", "metadata": {}}, "create_time": 1717900859.502543, "update_time": null, "content": {"content_type": "tether_quote", "url": "file-R5OSTQphu5vMdCpOZ04ALvLO", "domain": "Week 4_Systems Thinking for Life Cycle Sustainability Assessment.pdf", "text": "\nsustainability\n\nReview\n\nSystems Thinking for Life Cycle Sustainability\nAssessment: A Review of Recent Developments,\nApplications, and Future Perspectives\n\nNuri Cihat Onat 1,2, Murat Kucukvar 1,*, Anthony Halog 3 and Scott Cloutier 2\n\n1 Department of Industrial Engineering, Istanbul Sehir University, Uskudar, Istanbul 34662, Turkey;\nnurionat@sehir.edu.tr or nonat@asu.edu\n\n2 School of Sustainability, Julie Ann Wrigley Global Institute of Sustainability, Arizona State University,\nTempe, AZ 85281, USA; scott.cloutier@asu.edu\n\n3 School of Geography, Planning and Environmental Management, University of Queensland,\nBrisbane 4067, Australia; a.halog@uq.edu.au\n\n* Correspondence: muratkucukvar@sehir.edu.tr; Tel. : +90-444-40-34 (ext. 9256)\n\nAcademic Editor: Fausto Cavallaro\nReceived: 14 March 2017; Accepted: 26 April 2017; Published: 29 April 2017\n\nAbstract: Tracking the environmental impacts of production, use, and disposal of products\n(e.g., goods, and services) have been an important issue in the global economy. Although Life Cycle\nAssessment (LCA) is a widely applied method to track these environmental impacts and support\npolicies, it has certain limitations and an isolated way of evaluating the environmental impacts\nwith no consideration of social and economic impacts and mechanisms. To overcome the limits of\ncurrent LCA, three mechanisms have been proposed in the literature: (1) broadening the indicators\nby including social and economic indicators in addition to the environmental impacts; (2) broadening\nthe scope of analysis from product-level assessment to national and global levels; (3) deepening the\nassessment by inclusion of more mechanisms to account for interrelations among the system elements,\nuncertainty analysis, stakeholder involvement, etc. With these developments, LCA has been evolving\ninto a new framework called Life Cycle Sustainability Assessment (LCSA). Practical application of\nLCSA requires integration of various methods, tools, and disciplines. In this study, a comprehensive\nliterature review is conducted to investigate recent developments, current challenges, and future\nperspectives in the LCSA literature. According to the review, a high number (40%) of LCSA studies\nare from the environmental science discipline, while contributions from other disciplines such as\neconomics (3%) and social sciences (9%) are very low. On broadening the scope of analysis, 58% of\nthe studies are product-level works, while 37% quantified the impacts at national level and achieved\nan economy-wide analysis, and only 5% of the studies were able to quantify the global impacts of\nproducts using LCSA framework. Furthermore, current applications of LCSA have not considered\nthe rebound effects, feedback mechanisms, and interrelations of the system of interest sufficiently.\nTo address these challenges, we present a complete discussion about the overarching role of systems\nthinking to bring tools, methods and disciplines together, and provide practical examples from the\nearlier studies that have employed various system-based methods. We discuss the importance

of integrated system-based methods for advancement of LCSA framework in the following directions: (1) regional and global level LCSA models using multi-region input-output analysis that is capable of quantitatively capturing macro-level social, environmental, and economic impacts; (2) dealing with uncertainties in LCSA during multi-criteria decision-making process and expert judgments in weighting of LCSA indicators; and (3) integration of system dynamics modeling to reveal complex interconnections, dependencies, and causal relationships between sustainability indicators.

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Keywords: life cycle sustainability assessment; systems thinking; multi-region input-output analysis; system dynamics; uncertainty; triple bottom line sustainability accounting

1. Introduction

Life Cycle Sustainability Assessment (LCSA) is an interdisciplinary framework for integration of models rather than a method itself, and therefore there are many opportunities for integration of tools and methods to improve the applicability of LCSA [1,2]. Until now, practical use of LCSA in sustainability science and engineering is limited and this framework still continues to evolve within the scientific community [3,4]. The EU's 6th Framework program-funded Coordination Action for Innovation in Life Cycle Analysis for Sustainability (CALCAS) aims to overcome the limits of current Life Cycle Assessment (LCA) methods by presenting two mechanisms such as deepening and broadening to further advance the life-cycle sustainability modeling [5,6]. According to Guinée [7] and Guinée and Heijungs [8], broadening of LCSA can be accomplished by including environmental, social and economic aspects and enlarging the system boundary from a micro-level (process-based) to macro-level (economy-wide) analysis. Additionally, to deepen the LCSA framework, there is a need for considering the dynamic relationships among the LCSA parameters and analyzing the causality mechanisms between the system parameters, such as economic, social and environmental metrics [9].

There are still many unaddressed questions related to broadening and deepening of LCSA [5]. In a research on concept, practice and future directions for LCSA [10], the major shortcomings of LCSA framework are listed as: (a) lack of understanding the mutual dependencies and complex interactions among the sustainability indicators; and (b) reductionist approach and myopic view by looking at the Environmental LCA (E-LCA), Social LCA (S-LCA), and Life Cycle Costing (LCC) assessment results separately. In a recent work concentrating on the challenges and future of LCSA framework [7], extending the system boundary of LCSA from a micro to macro level analysis, dealing with complex dynamic relationships between social, economic and environmental indicators, integration of more quantitative social indicators, dealing with uncertainties, and developing scenario-based decision support tools for multi-criteria decision making are listed among the most critical challenges.

Similar critical and futuristic viewpoints are also presented in a work conducted by Cucurachi and Suh [11]. The researchers also concluded that LCSA should further evolve into a tool for a comprehensive quantitative sustainability assessment by using a wide range of socio-economic indicators, embracing causal relationships, and focusing on uncertainties in LCA results during the multi-objective decision-making. According to the aforementioned points that address critical issues for the future LCSA, broadened and deepened LCSA should definitely go beyond a snapshot (isolated and without consideration of temporal aspect) of sustainability assessment based on the environmental, economic and social

sustainability analysis of products or process [10]. Therefore, LCSA needs to be further developed using systemic approaches dealing with uncertainties, concentrating on stakeholder involvement in multi-criteria decision-making, focusing on causal dynamic relationships between the pillars of sustainability.

2. Literature Review

According to the literature review (Life Cycle Sustainability Assessment) in either title, abstract, or keywords for time span between 2000 and 2017, accessed on 10 January 2017 in Scopus database), there is a lack of cohesion between associated disciplines, which is one of the most important barriers against addressing the aforementioned research needs and challenges. Figure 1 shows the percentage of papers related to LCSA from different disciplines. Although there is a growing interest in LCSA frameworks, LCSA studies are limited to certain disciplines. A high number (40%) of LCSA studies are from the environmental science discipline, while contributions from other disciplines such as economics and social sciences are very low (see Figure 1). Furthermore, only 56 studies out of 109 studies found Sustainability 2017, 9, 706 3 of 25

works, while the rest are either qualitative or review studies. Because this study investigates the issues related to applications of LCSA, we investigated the works that are applied though a case study and didn't include the qualitative papers in our literature review analysis.

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qualitative or review studies. Because this study investigates the issues related to applications of LCSA, we investigated the works that are applied though a case study and didn't include the qualitative papers in our literature review analysis.

Figure 1. Percentage of peer-reviewed journal and conference papers (LCSA references from the bibliometric analysis of Scopus databases on Life Cycle Sustainability Assessment) in either title, abstract, or keywords for time span between 2000 and 2017, accessed on 10 January 2017).

Applications of LCSA studies are classified based on three dimensions of improvement in LCSA in accordance with Guin et al. [1]: (1) broadening of impacts from environmental impacts only to inclusion of economic and social indicators; (2) broadening the level of analysis from product level to economy-wide and global analyses; and (3) deepening the assessment mechanism by inclusion of scenario assessment, rebound effects, feedbacks and interconnections, multi-criteria decision-making/stakeholder involvement, and uncertainty analysis. Among the 109 studies, 56 studies presented an application of LCSA with various case studies, while great majority of the other studies focused on specific methodological aspects of LCSA and few conducted a literature review on certain aspects of LCSA.

Environmental Science 40% Engineering 18% Energy 15% Social Sciences 9% Business, Management and Accounting 5% Computer Science 3% Economics, Econometrics and Finance 3% Chemical Engineering 2% Chemistry 2% Materials Science 1% Physics and Astronomy 1% Medicine 1%

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involvement, and uncertainty analysis. Among the 109 studies, 56 studies presented an application of LCSA with various case studies, while great majority of the other studies focused on specific methodological aspects of LCSA and few conducted a literature review on certain aspects of LCSA.

According to bibliometric analysis, 58% of the studies (33 studies) are product-level works, while 37% of the studies quantify the impacts at national level and achieved an economy-wide analysis. On the other hand, only three studies were able to quantify the global impacts of products using LCSA framework. These three studies present an application of a new socio-economic indicator to measure geopolitical supply risks of materials of products [12,16,34]. Although the method proposed is a useful indicator that provides important insights for geopolitical risks, it relies on the first layers of supply chain outside of a country investigated. In other words, the proposed method considers the first layer of the multi-stage supply chain (outside of a country) as applied in the bilateral trade data analyses. This drawback might cause underestimation of impacts, which is known as truncation error [67]. Although encompassing the entire supply chain can be very challenging using process-level data, there are methods, such as hybrid input-output life cycle assessment, which are capable of capturing the impacts associated with the entire supply chain and can eliminate the truncation error (cut-off error) [68,201371]. As an alternative method, use of multi-regional input-output modeling can help.

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cover the entire global supply chain and eliminate the truncation error. The recent applications of this method are discussed in Section 3.1 as a possible way to broaden the scope of the LCSA. According to the literature review, all studies covered environmental dimensions of sustainability, while only one study did not include economic dimensions and four studies did not consider social dimensions in their LCSA application. This finding shows that almost all applications of LCSA studies achieved the first dimension of improvement in LCSA as broadening of indicators (impacts): inclusion of social and economic dimensions in addition to the environmental impacts. Although there might be other studies quantifying or assessing economic, social, and environmental impacts of goods, products, or services, these studies were not investigated. This is a drawback of the bibliometric analysis relying on the definition of LCSA, while ignoring the other studies encompassing these three dimensions with different methods than LCSA. Some other issues found in the literature are the inconsistency between indicator selection, challenges in quantification of social indicators, and assigning weight (prioritization) of different indicators. These challenges and some applications of LCSA studies addressing these challenges are presented in Section 3.1.

Literature analysis in deepening of LCSA showed that 46% of studies adopted scenario/policy assessment. Seventeen studies conducted uncertainty analyses for their LCSA results and 38 studies applied multi-criteria decision making or stakeholder involvement in LCSA. On the other hand, only two studies utilized a complete systems thinking approach encompassing feedback mechanisms and interconnections (indirect effects, the dynamic relationships among social, economic, and environmental dimensions, market mechanisms, etc.) among the system of interests. Such mechanisms are important because they can take into account system effects and consequences choices and policies proposed. For instance, a large-scale bioenergy production may affect the food supply, social structure (employment in different sectors), food prices, land use, and other indicators important to society, economy, and the environment. There were also no studies analyzing rebound effects in

LCSA. These findings showed that deepened mechanisms are not sufficiently covered in the LCSA community.

Addressing LCSA challenges can only be achieved using transformative and systemic approaches through involvement across disciplines [72]. In a recent study, Marvuglia et al. [73] proposed a conceptual framework through integrated computational methods calling for dynamic system modeling and involvement of stakeholders in multi-criteria decision-making. The authors present an important attempt to facilitate cooperation between scientists from different disciplines under the umbrella of a life-cycle sustainability analysis. However, until now, these challenges are mostly mentioned in conceptual studies rather than empirical works [1, 3, 4, 8, 53, 72, 74].

The practical examples and use of integrated methods and approaches are still less studied and limited to a group of researchers as stated in Table 1. Future direction for developing methods and tools should help the scientific community to move from approaches based on isolated disciplines towards inter/trans-disciplinarity and a holistic/systematic perspective in order to address emergent issues related to sustainability problems [77]. In this regard, systems thinking plays a crucial role to assist this move.

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Table 1. Bibliometric analysis of applied LCSA studies in between 2000 and 2017.

| ID# | Author and Year | Broadening Indicators | Broadening Boundary (Scope) | Deepening Environmental Economic Social Product-Level National | | | |
|---|--|--|--|---|-------------------------------------|--|--------------|
| Global Scenario / Policy Assessment Rebound Effects Interconnections and Feedbacks MCDM Stakeholder Involvement Uncertainty | n1 Gemechu, E.D., Sonnemann, G., Young, S.B. [12] | 2017 4 4 4 4 | n2 Ren, J., Ren, X., Liang, H., Dong, L., Zhang, L., Luo, X., Yang, Y., Gao, Z. [13] | 2016 4 4 4 4 | | | |
| n3 Van Kempen, E.A., Spiliotopoulou, E., Stojanovski, G., de Leeuw, S. [14] | 2016 4 4 4 4 | n4 Sou, W.I., Chu, A., Chiueh, P.T. [15] | 2016 4 4 4 4 | n5 Helbig, C., Gemechu, E.D., Pillain, B., Young, S.B., Thorenz, A., Tuma, A., Sonnemann, G. [16] | 2016 4 4 4 4 | | |
| n6 Azapagic, A., Stamford, L., Youds, L., Barteczko-Hibbert, C. [17] | 2016 4 4 4 4 | n7 Onat, N.C., Kucukvar, M., Tatari, O. [18] | 2016 4 4 4 4 | n8 Gumus, S., Kucukvar, M., Tatari, O. [19] | 2016 4 4 4 4 | | |
| n9 Touceda, M.I., Neila, F.J., Degrez, M. [20] | 2016 4 4 4 4 | n10 Pizzirani, S., McLaren, S.J., Forster, M.E., Pohatu, P., Porou, T.T.W., Warmenhoven, T.A. [21] | 2016 4 4 4 4 | n11 Onat, N.C., Kucukvar, M., Tatari, O., Egilmez, G. [9] | 2016 4 4 4 4 | | |
| n12 Luu, L.Q., Halog, A. [22] | 2016 4 4 4 4 | n13 Onat, N.C., Kucukvar, M., Tatari, O., Zheng, Q.P. [23] | 2016 4 4 4 4 | n14 Climaco, J.C.N., Valle, R. [24] | 2016 4 4 4 4 | | |
| Sustainability 2017, 9, 706 6 of 25 | Table 1. Cont. | ID# | Author and Year | Broadening Indicators | Broadening Boundary (Scope) | Deepening Environmental Economic Social Product-Level National | |
| Global Scenario / Policy Assessment Rebound Effects Interconnections and Feedbacks MCDM Stakeholder Involvement Uncertainty | n15 Kalbar, P.P., Birkved, M., Nygaard, S.E., Hauschild, M. [25] | 2016 4 4 4 4 | n16 Gal e n-Mart edn, c l, Guill o e n-Gos ellbez, G., Stamford, L., Azapagic, A. [26] | 2016 4 4 4 4 | n17 Moslehi, S., Arababadi, R. [27] | 2016 4 4 4 4 | |
| n18 Atilgan, B., Azapagic, A. [28] | 2016 4 4 4 4 | n19 Huang, B., Mauerhofer, V. [29] | 2016 4 4 4 4 | n20 Onat, N.C., Gumus, S., Kucukvar, M., Tatari, O. [30] | 2016 4 4 4 4 | n21 Dong, Y.H., Ng, S.T. [31] | 2016 4 4 4 4 |
| n22 Gencturk, B., Hossain, K., Lahourpour, S. [32] | 2016 4 4 4 4 | n23 Steen, B., Palander, S. [33] | 2016 4 4 4 4 | n24 Gemechu, E.D., Helbig, C., Sonnemann, G., Thorenz, A., Tuma, A. [34] | 2016 4 4 4 4 | n25 Luu, L.Q., Halog, A. [35] | 2016 4 4 4 4 |
| n26 Wagner, E., | | | | | | | |

Benecke, S., \nWinzer, J., \nF., \nNissen, N.F., \nLang, K. -D. [36] \n\n2016 4 4 \n\n27 Kalbar, P.P., Karmakar, S., \nAsolekar, S.R. [37] 2016 4 4 4 4 4 4 \n\n28 Keller, H., Rettenmaier, N., \nReinhardt G.A. [38] 2015 4 4 4 4 4 4 \n\n29 \nDe Luca, A.I., Iofrida, N., \nStrano, A., Falcone, G., \nGulisano, G. [39] \n\n2015 4 4 4 4 4 4 \n\n30 \nRen, J., Manzardo, A., \nMazzi, A., Zuliani, F., \nScipioni, A. [40] \n\n2015 4 4 4 4 4 4 \n\n31 Yu, M., Halog, A. [41] 2015 4 4 4 4 4 4 \n\n32 Hossaini, N., Reza, B., Akhtar, \nS., Sadiq, R., Hewage, K. [42] 2015 4 4 4 4 4 4 \n\n\nSustainability 2017, 9, 706 7 of 25 \n\n\nTable 1. Cont. \n\n\nID# Author and Year Year \n\n\nBroadening Indicators Broadening Boundary (Scope) Deepening \n\n\nEnvironmental Economic Social Product-Level National Global \n\n\nScenario/ \n\n\nPolicy \n\n\nAssessment \n\n\nRebound \n\n\nEffects \n\n\nInterconnections \n\n\nand Feedbacks \n\n\nMCDM/ \n\n\nStakeholder \n\n\nInvolvement \n\n\nUncertainty \n\n\n33 Peukert, B., et al. [43] 2015 4 4 4 4 \n\n\n34 Stamford, L., Azapagic, A. [44] 2014 4 4 4 4 4 4 \n\n\n35 \nAkhtar, S., Reza, B., Hewage, \nK., Shahriar, A., Zargar, A., \nSadiq, R. [45] \n\n2014 4 4 4 4 \n\n\n36 Mart \u00ednez-Blanco, J., et al. [46] 2014 4 4 4 4 4 4 \n\n\n37 Kucukvar, M., Gumus, S., \nEgilmez, G., Tatari, O. [47] 2014 4 4 4 4 4 4 \n\n\n38 Lu, B., Li, B., Wang, L., Yang, J., \nLiu, J., Wang, X.V. [48] 2014 4 4 4 4 \n\n\n39 Onat, N.C., Kucukvar, M., \nTatari, O. [49] 2014 4 4 4 4 4 4 \n\n\n40 Onat, N.C., Kucukvar, M., \nTatari, O. [50] 2014 4 4 4 4 4 4 \n\n\n41 Kucukvar, M., Noori, M., \nEgilmez, G., Tatari, O. [51] 2014 4 4 4 4 4 4 \n\n\n42 \nValdivia, S., Ugaya, C.M.L., \nHildenbrand, J., Traverso, M., \nMazijn, B., Sonnemann, G. [52] \n\n2013 4 4 4 4 4 4 \n\n\n43 Pesonen, H.-L., Horn, S. [53] 2013 4 4 4 4 4 4 \n\n\n44 Wood, R., Hertwich, E.G. [54] 2013 4 4 4 4 \n\n\n45 Ostermeyer, Y., Wallbaum, H., \nReuter, F. [55] 2013 4 4 4 4 4 4 \n\n\n46 Foolmaun, R.K., \nRamjeawon, T. [56] 2013 4 4 4 4 4 4 \n\n\n47 \nVinyes, E., Oliver-Sol \u00ed \u00e6, J., \nUgaya, C., Rieradevall, J., \nGasol, C.M. [57] \n\n2013 4 4 4 4 4 4 \n\n\n48 Manzardo, A., Ren, J., \nMazzi, A., Scipioni, A. [58] 2012 4 4 4 4 4 4 \n\n\n49 Stamford, L., Azapagic, A. [59] 2012 4 4 4 4 4 4 \n\n\n50 Traverso, M., Finkbeiner, M., \nJ \u00f8rgensen, A., Schneider, L. [60] 2012 4 4 4 4 4 4 \n\n\n\nSustainability 2017, 9, 706 8 of 25 \n\n\nTable 1. Cont. \n\n\nID# Author and Year Year \n\n\nBroadening Indicators Broadening Boundary (Scope) Deepening \n\n\nEnvironmental Economic Social Product-Level National Global \n\n\nScenario/ \n\n\nPolicy \n\n\nAssessment \n\n\nRebound \n\n\nEffects \n\n\nInterconnections \n\n\nand Feedbacks \n\n\nMCDM/ \n\n\nStakeholder \n\n\nInvolvement \n\n\nUncertainty \n\n\n51 Traverso, M., Asdrubali, F., \nFrancia, A., Finkbeiner, M. [61] 2012 4 4 4 4 4 4 \n\n\n52 Menikpura, S.N.M., \nGheewala, S.H., Bonnet, S. [62] 2012 4 4 4 4 4 4 \n\n\n53 \nNzila, C., Dewulf, J., \nSpanjers, H., Tuigong, D., \nKiriamiti, H., \nv an Langenhove, H. [63] \n\n2012 4 4 4 4 \n\n\n54 \nSchau, E.M., Traverso, M., \nLehmannann, A., \nFinkbeiner, M. [64] \n\n2011 4 4 4 4 \n\n\n55 Moriizumi, Y., Matsui, N., \nHondo, H. [65] 2010 4 4 4 4 4 4 \n\n\n56 Zhou, Z., Jiang, H., Qin, L. [66] 2007 4 4 4 4 \n\n\n\nSustainability 2017, 9, 706 9 of 25 \n\n\nWhy Systems Thinking and How It Relates to LCA? \n\n\nA system is defined as \u201can interconnected set of elements that is organized in a way that achieves \n\n\nsomething\u201d [78]. In other words, a system must have elements, interconnections, and function or \n\n\npurpose, which can be found in any products (goods and services), assessed using the LCA approach. \n\n\nFurthermore, the LCA itself is a system-based tool since it aims to track environmental impacts \n\n\nof products (systems) through its complex global supply chains (systems). In this sense, the LCA \n\n\napproach deals with systems that are nested within systems. Like LCA, LCSA is a system-based \n\n\ntool and deals with systems of systems with much broader and deeper considerations (revealing \n\n\nmacro-level impacts, consideration of social, and economic impacts, and taking into account underlying \n\n\nmechanisms). These aspects require LCSA practitioners and researchers to adopt systems thinking, \n\n\nwhich is defined as the

ability to see the parts of bigger mechanisms, recognizing patterns and interrelationships, and restructuring these interrelationships in more effective and efficient ways. According to the literature review on LCSA, there is a strong need for systems thinking perspectives and how it can be adopted towards coping with the challenges in LCSA. Hence, in this study, the overarching role of systems thinking is highlighted as a catalyzer of harmonizing tools, methods, and disciplines. The authors first explain the importance of systems thinking and present example applications for possible methodological approaches that can be used for advancing the current LCSA framework in the following directions: (1) regional and global level LCSA models using multi-region input-output analysis capable of capturing macro-level social, environmental, and economic impacts quantitatively; (2) dealing with uncertainties in LCSA during multi-criteria decision-making process and involving expert judgments in weighting of LCSA indicators; and (3) integration of system dynamics modeling to reveal complex interconnections, dependencies, and causal relationships between sustainability indicators.

3. Systems Thinking as a Catalyst for Harmonizing Tools, Methods, and Disciplines

Addressing the research gaps in the LCSA framework requires the adoption of system thinking. Although LCA and LCSA frameworks are both system-based approaches, meaning they allow us to track impacts over supply chains and basic relationships among the processes involved, they lack the understanding of interconnectedness and feedback relationships among different system elements (disciplines, processes, services, products, their surrounding environment, and their relationship with sustainability impacts). While there are studies highlighting the importance of use of integrated system-based tools [72,79,80], most of the applications do not consider the causal and feedback relationships. Systems thinking can allow us to improve our ability to understand elements (processes, indicators, sub-systems), their interconnections, ask 'what-if' questions about possible future impacts, and provide a better basis for practitioners and the scientific community towards redesigning systems (products, processes, supply chains, services, etc.). Adopting systems approach and life cycle thinking are crucial to deal with wicked problems of sustainability [81]. Integration of systems thinking methods and tools can redefine the role of LCA by bringing its scope beyond quantification/interpretation of the sustainability impacts to a domain where causal relationships among different indicators and sub-systems are revealed and to a solid base for system improvement. Such approaches have been widely applied in ecological, socio-ecological, and socio-technological systems research [82,83]. As the LCSA framework proposes a broader and deeper perspective, harmonization of these methods/tools/disciplines to address more complex problems is inevitable and necessary. In this regard, an outlook of the existing system-based tools and their recent applications, challenges, and possible future directions for LCSA framework is discussed in the following sections.

3.1. Broadening the Object of Analysis: Revealing Macro-Level Impacts Using Single and Multi-Region Input-Output Analysis

Almost all case studies using LCSA focused on the broadening of impacts dimension rather than broadening of system boundary of analysis focusing on macro level impacts of production and sustainability [9, 706 10 of 25] and consumption at national and global economy level. Obviously, with a globalized economy, while consumption of products takes place in some parts of the world, manufacturing and consumption occur in different parts of the world. However, the scope of the traditional LCA studies is predominantly at product level and does not address

macro-level impacts and cannot capture a majority of upstream impacts due to narrowly defined system boundaries (the cutoff criteria) [51,84,85]. To promote sustainable consumption and production policies and to understand the social, economic and environmental effects of consumption, there is a dire need to capture whole life cycle sustainability impacts across international supply chains. The importance of consideration of all indirect supply chain-related impacts (is also called economy-wide macro-level analysis) within the LCSA framework is emphasized in the Guinée et al. [1] as inter-related global sustainability issues require more comprehensive approaches in which the macro-level impacts (economy-wide, or global) covering entire supply chain is essential to reveal sustainability impacts of products, services, or systems. This is because process-based models involve a limited number of processes without tracing the entire supply chains of products, and the inclusion or exclusion of processes is decided on the basis of subjective choices, which create the so-called system boundary problem [67,86,87]. Past studies on the environmental footprint of sectors also showed that process-based models suffer from significant truncation errors, which can be of the order of 50% or higher [70,88,89].

At this point, Input-Output (IO) based LCA models provide a top-down analysis using sectoral monetary transaction matrixes considering complex interactions between the sectors of nations' economy [90,91]. Guinée et al. [1] emphasized the importance of the IO analysis for the future of LCSA and discussed the necessity of system-based sustainability assessment methods including hybrid LCA and IO LCA. In addition, Jeswani et al. [71] also discussed the importance of combination of IO analysis with LCA to create hybrid life cycle models in order to capture intra-sectoral flows on the meso-level LCSA. Although the applications of IO-based LCSA studies are not abundant in the literature, a handful of papers addressed the importance of extended system boundaries for the LCSA. For example, Wood and Hertwich [54] discussed the comprehensive scope of IO analysis in LCSA for socio-economic assessment. In response to the current research gaps related to comprehensive LCSA methods, Kucukvar et al. [51] built the first hybrid LCSA in which IO-based LCSA along with compromise programming methods used for a multi-criteria decision analysis of warm-mix and hot-mix asphalt mixtures. In other work, Onat et al. [49] and Tatari et al. [94] demonstrated usefulness of using IO analysis for quantification of social, economic, and environmental impacts for LCSA of residential and commercial buildings. In addition, Onat et al. [50] constructed a hybrid LCSA model combining process-based and IO-based approaches for LCSA of alternative vehicles in the United States.

Although single-region IO models are used in previous studies to enlarge the system boundary of LCSA to national economy, Multi Region Input-Output (MRIO) models can be a better modeling approach in the estimation of life-cycle impacts of production and consumption at global scale. Although the majority of previous LCSA studies using IO analysis were case studies focusing on sustainability impacts of products or processes in a single country [95], a MRIO analysis is critical for taking into account the role of international trade [96,97]. This is important since the majority of countries are open economies and life-cycle sustainability impacts of products are found in the geographical boundary of multiple countries [98,99]. A recent study also emphasized that significant proportion (64%) of total environmental, social and economic impacts stem from international trade [100]. Owing to the importance of growing global trade, MRIO models have become a widely discussed topic and they are used for regional and international policy making in environmental impact analysis

[101,102]. Currently, there are a number of initiatives aimed to compile large-scale global MRIOs such as Externality Data and Input-Output Tools for Policy Analysis (EXIOPOL), Global Trade Analysis Project (GTAP), World Input-Output Database (WIOD), Global Resource Accounting Model (GRAM), and EoRA [103-106]. Sustainability 2017, 9, 706 11 of 25 MRIO databases (e.g., EoRA, EXIOBASE, GRAM, WIOD and GTAP) are extensively used in order to capture the role of international trade for a holistic environmental footprint analysis. For example, some studies include carbon, water, and ecological land footprints of households [107,108], consumption and production [85,109], international trade [110], transportation [111], and nations [112,113]. Although these MRIO databases are extensively utilized for analyzing the regional and global environmental impacts, the integration of MRIO analysis with LCA is often limited. As a first empirical study, Wiedmann et al. [114] developed a two-region hybrid IO model to avoid truncation that can lead to erroneous rankings of LCA results. The researchers presented a case study showing usefulness of hybrid LCA for accounting the indirect greenhouse gas emissions of energy technologies in the United Kingdom (UK). In other work, Malik et al. [115] built a hybrid LCA for measuring the direct, as well as indirect energy and carbon impacts of production of bio-crude from algal resources, and used a global multi-regional LCA approach. The authors used a detailed MRIO table developed in the Industrial Ecology Virtual Laboratory for Australia consisting of 19 Australian regions and 344 industry sectors [116]. Hertwich et al. [117] also constructed a hybrid LCA model using the EXIOBASE database as a global MRIO database. The researchers analyzed the environmental impacts and resource requirements of different low-carbon electricity generation technologies for several electricity production sectors such as wind power, solar power, hydropower, and gas- and coal-fired power plants with carbon dioxide capture and storage. In a recent work, Ward et al. [118] developed a hybrid LCA model that allows estimating carbon dioxide impacts of new process technologies. The researchers utilized three global MRIO databases such as EXIOBASE, GTAP and WIOD and compared the LCA results using each MRIO database separately. However, the applications of above-mentioned MRIO-based LCA studies are mostly bounded by ecological, energy, carbon and water footprint categories for nation's production and consumption activities. Among the 56 case studies reviewed, the majority of studies used a detailed process-based LCSA (P-LCSA). A few studies used an IO-based hybrid LCSA analysis in order to extend the system boundary of analysis to economy level. However, there is no empirical work found among the case studies, which conduct a global MRIO analysis to broaden the system boundary to the global economy.

3.2. Broadening the Scope of System Boundary and Indicators: Triple Bottom Line Sustainability Accounting

To broaden the scope of LCSA indicators, triple bottom line (TBL) is used as an accounting framework, which integrates the three pillars of sustainability: society, environment, and economy [119]. Over the past decade, the interest in TBL accounting has been growing in industry, nonprofit organizations, and governments. In the literature, a few researchers have broadened the scope of indicators and system boundary simultaneously using an IO analysis, which is capable to quantify not only environmental pressures, but also social and economic impacts at macro level [120,121]. For example, the 2013 Balancing Act study is the first empirical study on macro level sustainability assessment of sectors using a TBL approach. The researchers from the Integrated Sustainability Assessment (ISA) research group at the University of Sydney analyzed the environmental, economic and social impacts of Australian

manufacturing and service sectors based on 10 macro-level sustainability indicators [120]. Similarly, the research team at the University of Central Florida utilized an IO analysis to build the first comprehensive TBL sustainability assessment framework of the U.S. economy. In their model, the Carnegie Mellon University Green Design Institute's EIO-LCA tool [69] is extended with additional socio-economic and ecological indicators for a complete TBL sustainability analysis. The researchers used gross operating surplus (GOS), gross domestic production (GDP) and imports for economic indicators; income, tax and injuries for social indicators; and water, energy, carbon and land footprint for environmental indicators [122].

In addition to the abovementioned studies focusing on sector-specific TBL analysis, several researchers used over 40 indicators to broaden the LCSA framework with additional indicators. On the other hand, a few studies found in the literature used a combined application of IO analysis and LCSA. For instance, Kucukvar et al. [51] built an IO-based hybrid LCSA model based on Sustainability 2017, 9, 706–12 of 25 sustainability indicators and analyzed the TBL sustainability impacts of road construction from hot-mix and warm-mix asphalt mixtures in the United States. Among the environmental indicators, water, energy, carbon, and land footprint, hazardous waste and toxic releases are quantified. GOS, GDP, Tax, Import, Income and injuries are considered socio-economic indicators. In a recent work, Onat et al. [50,123] utilized a holistic IO method for quantification of macro-level economic, social, and environmental impacts of alternative passenger vehicles. Among socio-economic indicators, the researchers used various socio-economic indicators such as human health, income, injuries, government tax, employment at various skill levels, emission cost, and profit, GDP and import. Among LCSA studies, the Sustainable Industrial Systems research group from the University of Manchester used a vast number of social, economic and environmental indicators. The researchers primarily used a process-based LCSA framework for the life cycle sustainability impacts of electricity production in U.K. In addition, scenario-based analysis is also conducted to see the long-term socio-economic and environmental implications of electricity generation policies [44,124]. Similarly, Traverso et al. [60] built a process-based LCSA model and life cycle costing is used for economic impact analysis of sustainability assessment of the assembly step of photovoltaic (PV) modules production. Among the social sustainability indicators, number of workers, worker's gender type, and average wage rate are considered. However, the authors concluded that there are still challenges for a useful application and the selection of social LCA indicators and how to set weights for determining the importance of life cycle sustainability indicators. To that end, most of the studies reviewed tried to broaden the scope of indicators rather than the scope of system boundary using IO analysis and/or hybrid LCA approaches.

3.2. Deepening the Assessment: Revealing Dynamic, Causal, and Trade-Off Relationships

The goal of LCA is to assess the environmental impact of products from a system perspective and to identify possible improvement strategies [125,126]. Developing strategies to improve the environmental, social, and economic performance of a product cannot be realized with an isolated evaluation of impacts in these different domains as system-of-interest, considering the fact that environment, society, and economy are interconnected and affect one another [9]. For instance, if goods or services become cheaper due to improved efficiency, meaning an improved environmental performance, a consumer may benefit from these products more often and eventually may have a greater environmental impact or offset the potential environmental impact reduction

[127]. This feedback from the system-of-interest is called rebound effect and it mainly represents the interconnection between the system-of-interest (product), economy (LCC), and the environment. There are also indirect effects that cannot be captured with traditional LCA approaches. For example, biofuels can have indirect land use change offsetting the environmental benefits [128]. Capturing indirect effects requires a proper boundary definition and an understanding of the underlying mechanism causing the indirect effect [129]. LCA relies on cause-effect relationships in the environment and focuses on understanding the environmental consequences of actions [125]. However, traditional cause-effect relationships can be misleading and insufficient for explaining indirect effects as the complexity of a system increases [132]. Such static approaches cannot capture the major relationships between the system-of-interest (product, process, service, sector, etc.) and its surrounding environment (social, economic, and environmental systems interacting with the system-of-interests). Understanding system behavior, revealing the dynamic and causal relationships are essential to be able to, not just to predict, but envision the future impacts and redesign systems by determining major factors malfunctioning systems [78]. System dynamics (SD) modeling philosophy is one of the most suitable methods for achieving such objectives since it helps defining the multi-dimensional causal relationships, potential delays, and feedback mechanisms quantitatively [133]. Hence, integration of SD to LCSA framework can advance the LCSA as a decision-support tool and provide a better foundation for effective policy making. In this regard, Onat et al. [9] developed a SD model to analyze sustainability impacts of alternative vehicle technologies. For the first time, SD methodology is integrated to LCSA framework to broaden (economy wide assessment, inclusion of social and Sustainability 2017, 9, 706 13 of 25) economic parameter) and deepen (interconnections, dynamics, feedbacks) the assessment. Life cycle sustainability impacts of alternative vehicle technologies are analyzed from a systems perspective by considering dynamic and causal relationships among transportation sector, economy, and the environment. Figure 2, the causal loop diagram, shows these major relationships among the system parameters (sub-models). The study provided important findings and showed how SD can be utilized to provide a better understanding of underlying mechanisms within the system of interest and its TBL impacts. The proposed model is composed of four comprehensive sub-models with one being the system-of-interest (transportation system) and its triple bottom line impacts (sub-models of the environment, economy, and society). These four major sub-models contain smaller sub-models such as public welfare, human health, employment, GDP, vehicle ownership cost, CO2 emissions and climate change, particulate matter formation (PMF), photochemical oxidant formation (POF), population, travel need, and on-road fuel efficiency. In total, twelve causal loops (causal mechanisms) are identified and their relationships are mathematically presented. These loops represent the feedback relationships among the main parameters of the model. They have either reinforcing or balancing effect and the total feedback impact depends on their relative strengths over time compared to one another. In other words, reinforcing and balancing loops cancel each other at varying degrees and whatever remains is the total feedback effect. In this system, feedback impacts are smaller compared to other impacts from exogenous drivers (impacts coming from outside of the defined system boundary) such as economic and population trends, greenhouse gasses from rest of the economy and world. Although a significant behavioral change is not observed resulting from feedback impacts, there might be cases where the system

behavior changes significantly due to feedback impacts. The study provides the first empirical application and methodological framework for advancement of LCSA as it addresses most of the current research gaps in the LCSA literature. For more detailed information please see Onat et al. [9].

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Figure 2. Causal loop diagram of the model.

Considering that LCSA framework deals with various dimensions—economy, environment and the society—integration of multi-criteria decision support tools is becoming crucial to provide a very critical guidance to LCA practitioners [11,71]. LCSA considers positive impacts such as social and economic (e.g., employment, profit, economic value added), as well as negative impact such as the associated environmental pressures (e.g., toxic emissions, waste, land use). When we try to make decisions on the sustainability of products, unwanted environmental burdens and socio-economic benefits easily become conflicting objectives. Therefore, multi-criteria decision making (MCDM) approaches have become a very robust and necessary approach for such circumstances, being able to

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important challenges in MCDM such as how to assign weights and aggregate the indicator results [7,47,136,137]. A limited number of researchers have focused on the MCDM and integrated expert weighting for sustainable product selection based on LCSA results [60,138,139]. In the literature, applications of MCDM methods combined with LCA results are abundant; however, few studies applied MCDM methods for dealing with multiple criteria, expert judgments, and uncertainties in LCSA [58,140]. To give some examples, Onat et al. [23] used a combined application of multi-criteria optimization and an IO-based hybrid LCSA. The researchers used a compromise programming as a tool for MCDM and applied their method for optimum vehicle allocation problem based on 16 macro-level sustainability impacts. Expert weighting and scenarios analysis are used for an integrated decision-making. The authors also concluded that the proposed method could be used as a practical decision-making platform when deciding which type of product to promote given each alternative's comparative and conflicting environmental, economic, and social impacts. In another work, Onat et al. [30] developed an IO-based hybrid LCSA model using several macro-level social, economic, and environmental indicators. The LCSA results are then combined with Intuitionistic Fuzzy Sets and Technique for Order-Preference by Similarity to Ideal Solution (TOPSIS) approaches [30]. In their work, an intuitionistic fuzzy set method is utilized to determine the weights of each social, economic and environmental metric based on inputs from expert judgments. The scenario-based Intuitionistic Fuzzy MCDM and TOPSIS methods are utilized to rank the life cycle sustainability performance of alternative passenger vehicles. The research also used Life Cycle Sustainability Triangle (also used in Traverso et al. [60]) in order to reflect the sensitivity of expert weighting in multi-criteria decision-making based on LCSA results. In other work, Kucukvar et al. [51] used a compromise programming to solve the multi-objective optimization problem, which has the tradeoffs between environmental and socio-economic indicators. The researchers built their optimization model upon LCSA results to determine the optimal asphalt pavement allocation strategy for a functional unit of 1 km pavement using sustainability weights ranging between 0 and 1. The researchers used several weighting scenarios for LCSA indicators and used a Monte Carlo simulation technique in order to deal with possible uncertainties in LCSA results. Kucukvar et al. [47] developed the first fuzzy-based MCDM model applied for the ranking of best pavement design. The authors used a double layer fuzzy decision-making method, which assigns weight for each life cycle phase as well as considers uncertainties in life cycle sustainability performance of alternatives. In their research, the authors used linguistic terms such as 'very good', 'good', 'very bad', etc. to deal with uncertainties in final LCSA results. Overall, the aforementioned studies represent the recent application of LCSA and MCDM as well as scenario-based group decision making considering expert judgments and uncertainties in environmental, economic and social impact categories.

4. Challenges and Future Directions

There are various challenges associated with abovementioned tools and their application within the LCSA framework. First, the selection of indicators remains as a challenging point of LCSA framework. According to the literature review, a great majority of LCSA (52 out of 56) studies focused on Sustainability 2017, 9, 706 15 of 25 on the broadening of impacts dimension. However, it is critical to note that economic and social impacts are still limited to a few indicators. For instance, economic impacts are mostly calculated using the LCC analysis that fails to capture the full dimension of economic sustainability [54,141].

Several other key financial indicators such as gross value added, profit, import dependency, levelized cost, profit, etc. can be used to extend the depth of the economic analysis [59,89]. So far, the applications of social indicators are also not studied sufficiently. S-LCA is still in its infancy and the applicability of S-LCA is highly limited due to data needs, difficulties in data quantification, and subjective nature of the social indicators. In recent works, some important social indicators such as human health impacts, employment, accidents and safety, public acceptance, life expectancy, public welfare and equity are used quantitatively in S-LCA of energy and transportation systems [9,44,49], and these quantitative indicators can be improved and applied to other LCSA studies, as well. In addition, SETAC and UNEP are continuously working on establishing a framework for the inclusion of socio-economic impacts and convert current E-LCA into a triple-bottom-line sustainability assessment model. At this point, applications of S-LCA are becoming the main challenge due to data availability and lack of standard methods and tools to gather product specific social impacts data [52,142,143]. A recently developed social hotspot database contains country- and sector-based statistical data to screen potential hotspots at a macro level and to provide detailed social assessments about the value chain [142]. The Roundtable for Product Social Metrics is also trying to address these concerns and to develop a harmonized method through a collaborative approach. Further, indices like the Social Progress Index [144] and the Sustainable Neighborhoods for Happiness Index [145], and measures of social capital [146] and social cohesion [147] serve as potential measures for S-LCA models. Ultimately, efforts exist to identify a set of standardized S-LCA indicators grouped under workers, consumers and communities such as child labor, safety, well-being, etc. S-LCA can also be used to analyze the extent to which human well-being, both subjective (e.g., happiness, life satisfaction) and objective (e.g., health, biostatistical measures of stress), are promoted while supporting social, ecological, economic, and cultural sustainability [148].

Second, global MRIO databases are mostly used for environmental analysis, and there are no research efforts employing recently developed MRIOs for a global LCSA. However, MRIOs can be a superior method for extending the scope of LCSA framework from a regional economy to global economy. At this point, the sector resolution in global multiregional Supply-Use tables continues to be one of the top challenges hindering a wide adoption of MRIOs in LCSA studies. The findings of recent studies also showed that disaggregation of IO data are superior to aggregating environmental data in determining IO multipliers and minimize uncertainties [149,150]. Therefore, recently developed MRIOs such as EXIOBASE, GTAP, WIOD, and EoRA should be improved using high country and sector resolution MRIO data and even more intra-country regional detail. Especially, the EXIOBASE covers the 27 EU member states as well as 16 non-EU countries with rest-of-the-world accounts, distinguishing 200 products, 163 industries, a dozens of environmental impact categories, as well as several socio-economic indicators (e.g., employment and income based on skill groups). The EXIOBASE contains more detailed sector and product accounts to disaggregate product and industry totals [151], therefore it is suitable for the product and/or sector level global LCSA analysis. Especially, the THEMIS, which is a hybrid input-output model developed from the EXIOBASE, can provide an important base for a global life cycle environmental, economic and social impacts of new products and technologies based on impact of human health, social well-being, prosperity, natural environment and exhaustible resources [117]. Another high-resolution MRIO database that can be a powerful tool is currently under development and the researchers from the Stockholm

Environment Institute (SEI) are working on development of the Input-Output Analysis Tool (IOTA), which is a hybridized version of MRIO analysis. This model includes 236 regions of production, 57 economic sectors and various environmental footprint categories and sustainability indexes [152]. If IOTA would be extended with socio-economic metrics and a high-resolution input-output data, this newly developed MRIO tool can also be used to conduct a global LCSA considering micro and macro level impacts. Sustainability 2017, 9, 706 16 of 25 Third, global MRIO databases are powerful tools to broaden the scope of LCSA to global analysis. However these databases are subject to uncertainties related to data year, collection process and differences in establishing IO tables of national economies. Most of the MRIO databases are using old datasets based on the 2000s. With an exception, some databases such as EoRA and WIOD provide time series data; however most of these MRIO databases do not have enough sector resolutions, which make them unsuitable for a detailed hybrid LCSA. Among these MRIOs, there is an ongoing research on developing a time series Supply-Use MRIOs for the period between 1995 and 2014 [153]. Once it becomes available, the EXIOBASE 3 can be an excellent tool to conduct a time-series global LCSA at global scale. Overall, the use of MRIO databases might result in significant uncertainties in LCSA results. To minimize such uncertainties, one suggested method is to make comparisons between different MRIO databases [96,150,154]. As an alternative method, the authors suggested an uncertainty analysis of economic input-output relationships and environmental intensity vectors that can improve the validity of the result presented in MRIO studies. In this regard, developing stochastic Leontief matrix and pollution intensity vectors remains as an important future work that needs a great effort for data collection and analysis. To determine the standard deviations of multipliers, Lenzen et al. [149] discussed the importance of considering the stochastic variation of whole MRIO system using Monte Carlo techniques. In order to maintain and increase the credibility of proposed system-based life cycle decision-support tools (IO analysis, hybrid IO LCA, MRIO LCA, system dynamics, etc.), the researchers need to develop these tools transparently (replicable) and deal with uncertainties associated with data and assumptions. While integration of SD modeling can be very helpful to understand dynamic complexity and the system as a whole, it brings different challenges and uncertainties. Because such LCSA applications aim to include additional mechanisms such as relationships among different sub-systems (e.g., rebound and feedback effects), spatial and temporal variations etc., results are highly sensitive to assumptions made [155]. Although such assumptions are very influential in traditional LCA approaches [156], any additional step towards increasing the boundary brings additional uncertainties. These additional uncertainties are mostly related to formalization of the nexus between social, economic, and environmental sub-systems interacting with the system-of-interest (the system assessed). Although methods such as Exploratory Modeling Analysis [18,157] and reliability theory [158], and viability theory [159] might be helpful to address uncertainties, the major source of uncertainties are the assumptions made when mathematically defining dynamic relationships among system parameters (especially in further parts of the system). Overcoming this challenge requires further attention from the scientific community and in-depth research about how things affect each other. One well-known example of such efforts is the Dynamic Integrated model of Climate and the Economy (DICE) model [160]. The DICE model provided a basis for understanding how economy and climate can affect each other. Similarly, there is a strong need for models defining relationships

between parameters (indicators) of environment-economy-society. Such models can exponentially contribute to the future LCSA as researchers can integrate these small models, modify these in accordance with their system-of-interest, and create new models to investigate life cycle sustainability impacts of various products. This can be a model library containing models explaining specific relationships among parameters from different domains such as how increased per capita income effect public welfare, how human health status influences population dynamics, how mobility affects consumption of a particular product, and how equity affects human well-being. In fact, all of these are parts of a bigger picture and can be brought together when trying to address complex issues. In a world where everything is disconnected, quantification of impacts separately and isolating each from the bigger system can mislead our decisions about products, services, or goods. Therefore, systems thinking play a vital role to bridge different systems, disciplines, and methods.

A strong understanding of systems thinking is essential for the LCA community as well as decision-makers from industries and government organizations. According to the theory of bounded rationality, stakeholders including industries, government organizations, and researchers [161,162]. However, none of these stakeholders have perfect information, especially about more distant parts of the system [78]. Hence, decisions about products/policies are made with limited or delayed information, and causes discrepancies between goals and perceived present conditions. Furthermore, systems thinking is mostly discussed among systems thinkers with less emphasis on applicability or usefulness to those outside the circle (industries, organization, different disciplines in scientific community). Thus, a need exists for systems-thinking teaching and learning research to support LCSA models. System-based solutions are mostly problem or context-specific. Therefore, they usually cannot be applied to other domains without an understanding of systems language and the systems in a new domain [163]. Although bringing out examples of context-specific solutions are quite helpful and can be learned from, the overarching role of systems thinking as a catalyst to harmonize methods, and disciplines cannot be realized without developing a common systems language within and beyond the scientific community. Development of a common system language might be one of the most important challenges for advancement of LCSA as addressing complex issues certainly requires harmonization of methods, tools, and disciplines.

5. Conclusions and Perspective

There is strong need for a shared understanding of the inherent interconnectedness and complexity of sustainable development. In this regard, developing a common system language for harmonization of various tools, methods, and disciplines is essential for addressing challenges related to LCSA as well as the UN's sustainable development goals. Integrated modeling approaches can help to clarify and articulate the interconnected system of goals and to analyze and inform key policies, programs and projects for their impact on sustainable development goals [164]. Integrating MRIO databases and SD modeling, along with quantitative social and economic indicators, has a strong potential for addressing current challenges of LCSA as well as UN's sustainable development goals.

No matter how sophisticated/advanced the models, approaches, or frameworks we apply, the goal should not be foreseeing the future exactly, which is unrealistic considering the immense sea of uncertainties. It rather should be envisioning the future and bringing it into being [78]. A prerequisite condition for realizing the future is a better understanding of mechanisms and further parts of

the systems, and how these link to our intended objectives. For instance, do we envisage a world supporting our current objectives of production and consumption, or do we envisage a world where all humans are offered an opportunity to thrive? Such questions might also guide life cycle models. In this regard, we need to generate basic knowledge of dependencies among critical sustainability indicators. A better understanding of systems thinking in LCSA framework can be turned into a knowledge generation mechanism with positive impact on sustainability science and can pave the way for standardized set of sub-models (smaller compact models) explaining major and basic relationships among sustainability impacts. Such knowledge generation mechanism can help dissemination of the LCSA framework and increase the applicability/usefulness to those outside the circle and can bridge different disciplines. On the other hand, expecting adoption of stronger systems thinking and practice in LCA can still be early for industry, since internalization of life cycle thinking has not been fully adopted outside of academia. Sending humans to the moon in the 60s was realized when the integration across disciplines and systems are accomplished [11]. Similarly, as most of the technological inventions, systems of systems, are built upon its preceding systems, starting to create interdisciplinary system dynamics models explaining the basic relationships among the sustainability indicators (impacts), processes, services, and products can lead to creating better assessment tools for advancement of LCSA.

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Author Contributions: Nuri Cihat Onat conducted the literature review, synthesis, and analysis. Nuri Cihat Onat wrote discussions related to deepening of LCSA framework (e.g., systems thinking, system dynamics, uncertainty, etc.) and future perspectives. Murat Kucukvar analyzed the literature review findings and wrote discussions related to broadening the LCSA framework (multi-regional input-output modeling, use of input-output modeling to quantify social and economic impacts, etc.) and contributed to writing of all sections. Anthony Halog contributed to conclusions, future perspective and provided insightful feedbacks for all sections. Scott Cloutier contributed to the parts related to S-LCA and methods and perspectives for accounting well-being/happiness indicators for S-LCA. All authors contributed to each section of the paper at different degrees.

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local economies, and long-term financial viability.\n- **Social**: Effects on local communities' access to natural resources, job creation, and working conditions.\n\n### 4. Assessment and Data Collection\n- **Environmental Data**: Gather data on water usage, energy consumption, greenhouse gas emissions, and waste volumes.\n- **Economic Data**: Analyze cost structures, benefits from sustainable practices, and economic contributions to local communities.\n- **Social Data**: Assess community impacts, including changes in water availability and job opportunities.\n\n### 5. Impact Assessment\n- **Modeling Environmental Impacts**: Use software tools like SimaPro or GaBi to model environmental impacts based on collected data.\n- **Economic Analysis**: Evaluate cost savings from efficiency improvements and the return on investment in sustainability measures.\n- **Social Impact Analysis**: Assess improvements or declines in community well-being, water accessibility, and employment.\n\n### 6. Interpretation\n- **Key Findings**: Identify the most significant impacts across all dimensions and stages.\n- **Hotspots**: Highlight areas with the highest potential for improvement.\n\n### 7. Recommendations\n- **Improvement Opportunities**: Suggest measures for reducing water and energy use, minimizing waste, and enhancing community relations.\n- **Policy Development**: Recommend policies for sustainable resource management and community engagement.\n\n### 8. Reporting and Review\n- **Documentation**: Prepare a comprehensive report detailing methods, findings, and recommendations.\n- **Stakeholder Review**: Engage with internal and external stakeholders to review findings and plan further actions.\n\n### Implementing Sustainability Measures\nBased on this LCSA, Sanpellegrino could implement specific sustainability initiatives such as improving water efficiency, shifting to renewable energy sources, enhancing waste recycling processes, and engaging more closely with local communities to ensure that the business operations contribute positively to the local environment and society.\n\nThis model serves as a foundation for Sanpellegrino to continually assess and improve its sustainability performance, addressing both the immediate impacts of its operations and contributing to long-term sustainability goals.]]}, "status": "finished_successfully", "end_turn": true, "weight": 1.0, "metadata": {"citations": [], "gizmo_id": null, "message_type": null, "model_slug": "gpt-4", "default_model_slug": "gpt-4", "pad": "AAAAAAAAAAAAAAAA", "parent_id": "f94bbab9-f913-4b3a-b5dc-e63d31c0dba7", "request_id": "890dc1eeded65249-MXP", "timestamp_": "absolute", "finish_details": {"type": "stop", "stop_tokens": [100260]}, "is_complete": true}, "recipient": "all", "channel": null}, "parent": "f94bbab9-f913-4b3a-b5dc-e63d31c0dba7", "children": [{"id": "105b2882-907c-4cf9-b4de-549536f01dee"}], "105b2882-907c-4cf9-b4de-549536f01dee": {"id": "105b2882-907c-4cf9-b4de-549536f01dee", "message": {"id": "105b2882-907c-4cf9-b4de-549536f01dee", "author": {"role": "system", "name": null, "metadata": {}}, "create_time": 1717900967.162152, "update_time": null, "content": {"content_type": "text", "parts": [""], "status": "finished_successfully", "end_turn": null, "weight": 1.0, "metadata": {"attachments": [], "rebase_system_message": true, "timestamp_": "absolute", "message_type": null, "is_visually_hidden_from_conversation": true}, "recipient": "all", "channel": null}, "parent": "adf73fc2-9fla-4698-bd8b-1bc9305af37f", "children": [{"id": "aaa202e0-41b7-439f-a00a-979ac79a23d9"}], "aaa202e0-41b7-439f-a00a-979ac79a23d9": {"id": "aaa202e0-41b7-439f-a00a-979ac79a23d9", "message": {"id": "aaa202e0-41b7-439f-a00a-979ac79a23d9", "author": {"role": "user", "name": null, "metadata": {}}, "create_time": 1717900967.164291, "update_time": null, "content": {"content_type": "text", "parts": ["\nCREATE A POSTER THAT VISUALIZES THE LIFE CYCLE ASSESSMENT FOR SANPELLEGRINO\nBELOW\n\nCreating a Life Cycle Sustainability Assessment (LCSA) for Sanpellegrino

involves integrating environmental, economic, and social dimensions of sustainability throughout the product's lifecycle. Here's a simplified model based on the provided documents:

1. Goal and Scope Definition

- Goal:** Evaluate the sustainability performance of Sanpellegrino's bottled water production to identify opportunities for improvement and guide strategic decisions towards sustainability.
- Scope:** The assessment covers the lifecycle stages from water extraction to disposal of the bottled product, including transportation and use phases.

2. Lifecycle Stages

- Raw Material Acquisition:** Water extraction from natural springs, focusing on the impact on local water tables and ecosystems.
- Production:** Bottling process, including the energy used and emissions generated during manufacturing.
- Distribution:** Transport of the finished products to markets, considering fuel consumption and emissions from vehicles.
- Use:** Consumer use, focusing on recycling and waste management practices.
- End-of-Life:** Disposal and recycling of packaging, assessing the effectiveness of recycling programs and the environmental impact of waste.

3. Sustainability Indicators

- Environmental:** Water consumption, carbon footprint, energy use, and waste generation.
- Economic:** Cost-effectiveness of sustainable practices, impact on local economies, and long-term financial viability.
- Social:** Effects on local communities; access to natural resources, job creation, and working conditions.

4. Assessment and Data Collection

- Environmental Data:** Gather data on water usage, energy consumption, greenhouse gas emissions, and waste volumes.
- Economic Data:** Analyze cost structures, benefits from sustainable practices, and economic contributions to local communities.
- Social Data:** Assess community impacts, including changes in water availability and job opportunities.

5. Impact Assessment

- Modeling Environmental Impacts:** Use software tools like SimaPro or GaBi to model environmental impacts based on collected data.
- Economic Analysis:** Evaluate cost savings from efficiency improvements and the return on investment in sustainability measures.
- Social Impact Analysis:** Assess improvements or declines in community well-being, water accessibility, and employment.

6. Interpretation

- Key Findings:** Identify the most significant impacts across all dimensions and stages.
- Hotspots:** Highlight areas with the highest potential for improvement.

7. Recommendations

- Improvement Opportunities:** Suggest measures for reducing water and energy use, minimizing waste, and enhancing community relations.
- Policy Development:** Recommend policies for sustainable resource management and community engagement.

8. Reporting and Review

- Documentation:** Prepare a comprehensive report detailing methods, findings, and recommendations.
- Stakeholder Review:** Engage with internal and external stakeholders to review findings and plan further actions.

Implementing Sustainability Measures

Based on this LCSA, Sanpellegrino could implement specific sustainability initiatives such as improving water efficiency, shifting to renewable energy sources, enhancing waste recycling processes, and engaging more closely with local communities to ensure that the business operations contribute positively to the local environment and society.

This model serves as a foundation for Sanpellegrino to continually assess and improve its sustainability performance, addressing both the immediate impacts of its operations and contributing to long-term sustainability goals.

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 below \nHere's a slide deck based on the attached document, structured according
 to the provided outline/guideline for creating the presentation:\n\n---\n\n### Slide 1:
 Title Slide\n**Title**: Advocating for Sustainable Practices in the Bottled Water
 Industry \n**Subtitle**: A Proposal to the Board of Directors of X-Corp
 \n**Presented by**: [Your Name], CEO \n**Date**: [Date]\n\n---\n\n### Slide 2:
 Opening Statement\n**Title**: Opening Statement \n**Content**: \n\"As the newly
 appointed CEO, I acknowledge the challenges we face in maintaining our operations
 while ensuring sustainable practices. It is our responsibility to adopt strategies
 that not only secure our company's future but also safeguard our environment and
 society.\" \n\n---\n\n### Slide 3: Current State Analysis\n**Title**: Environmental
 Impact of Water Extraction \n**Content**: \n- **Depletion of Aquifers**: Over-
 extraction leading to reduced water tables. \n- **Ecosystem Disruption**: Negative
 impacts on local flora and fauna. \n- **Water Scarcity**: Increased stress on already
 scarce water resources. \n**Visual**: Diagram showing the depletion of a water source
 over time. \n\n---\n\n### Slide 4: Externalized Costs to Society\n**Title**:
 Externalized Social Costs \n**Content**: \n- **Reduced Access**: Local communities

facing reduced water availability. \n- **Health Impacts**: Increased waterborne diseases due to lower water quality. \n- **Economic Strain**: Higher costs for local residents and farmers. \n**Visual**: Chart comparing water availability before and after extraction.\n\n---\n\n#### Slide 5: Economic Impacts\n**Title**: Economic Contributions vs. Costs \n**Content**: \n- **Revenue Generation**: Significant contribution to local and national economies. \n- **Employment**: Stable job opportunities provided by the industry. \n- **External Costs**: Environmental degradation and social costs not accounted for. \n**Visual**: A balance scale showing economic benefits on one side and external costs on the other.\n\n---\n\n#### Slide 6: Life Cycle Sustainability Assessment (LCSA)\n**Title**: Life Cycle Sustainability Assessment \n**Content**: \n- **Stages**: Extraction, Bottling, Distribution, Disposal. \n- **Environmental Impact**: CO2 emissions, water use, waste generation. \n- **Areas for Improvement**: Efficient extraction, sustainable packaging, recycling initiatives. \n**Visual**: LCSA diagram with environmental impact at each stage.\n\n---\n\n#### Slide 7: Process Chains and Inefficiencies\n**Title**: Current Process Chains \n**Content**: \n- **Extraction**: High water usage and inefficiencies. \n- **Bottling**: Energy-intensive processes. \n- **Distribution**: Significant carbon footprint. \n**Visual**: Flowchart highlighting points of inefficiency.\n\n---\n\n#### Slide 8: Stock Flows and Sustainability\n**Title**: Stock Flows and Sustainability \n**Content**: \n- **Inflow**: Natural water sources. \n- **Outflow**: Bottled products, waste. \n- **Sustainability Issues**: Unsustainable inflow and outflow balance. \n**Visual**: Diagram showing inflow and outflow of resources.\n\n---\n\n#### Slide 9: Proposed Sustainability Measures\n**Title**: Sustainability Measures \n**Content**: \n1. **Water Conservation Technologies**: Invest in efficient extraction and recycling. \n2. **Alternative Water Sources**: Explore and utilize alternative sources. \n3. **Community Engagement**: Involve local communities in decision-making. \n4. **Eco-friendly Packaging**: Shift to biodegradable materials. \n5. **Carbon Footprint Reduction**: Optimize distribution to lower emissions. \n**Visual**: Icons representing each measure.\n\n---\n\n#### Slide 10: Quantifying Benefits\n**Title**: Quantifying Benefits \n**Content**: \n- **Water Usage**: Reduction by 20% with new technologies. \n- **Carbon Emissions**: Decrease by 15% through optimized logistics. \n- **Cost Savings**: Long-term savings through sustainable practices. \n**Visual**: Bar graph showing projected improvements.\n\n---\n\n#### Slide 11: Benefits and Outcomes\n**Title**: Benefits and Outcomes \n**Content**: \n- **Environmental**: Reduced impact on ecosystems, improved water quality. \n- **Social**: Better access to water for local communities, improved public health. \n- **Economic**: Lower operational costs, enhanced brand image, compliance with regulations. \n**Visual**: Summary chart of benefits.\n\n---\n\n#### Slide 12: Call to Action\n**Title**: Call to Action \n**Content**: \n"By adopting these sustainability measures, we can lead our industry towards a more responsible and profitable future. I urge the Board to approve these initiatives, aligning with our corporate goals of profitability, sustainability, and social responsibility."\n\n---\n\n#### Slide 13: Conclusion\n**Title**: Conclusion \n**Content**: \n"Together, we can make a significant impact on the environment, society, and our business. Let us commit to these changes for a sustainable future."\n\n---\n\n#### Slide 14: Q&A\n**Title**: Questions & Answers \n**Content**: \n"Thank you for your attention. I am now open to any questions you may have."\n\n---\n\nThis slide deck presents a structured argument for the Board of Directors of X-Corp, advocating for sustainable practices within the bottled

water industry. It outlines the environmental, social, and economic impacts, and proposes specific measures to enhance sustainability."}], "status": "finished_successfully", "end_turn": null, "weight": 1.0, "metadata": {"request_id": "890d73818a6e4c75-MXP", "message_source": null, "timestamp": "absolute", "message_type": null}, "recipient": "all", "channel": null}, "parent": "63e16c6b-43e2-4d82-92f4-2d975d6ca50f", "children": [{"id": "90671afa-0c6c-4e48-b144-dcf15b60ddc2"}], "90671afa-0c6c-4e48-b144-dcf15b60ddc2": {"id": "90671afa-0c6c-4e48-b144-dcf15b60ddc2", "message": {"id": "90671afa-0c6c-4e48-b144-dcf15b60ddc2", "author": {"role": "assistant", "name": null, "metadata": {}}, "create_time": 1717897647.410676, "update_time": null, "content": {"content_type": "text", "parts": ["Hello! Excited to bring your visions to life? Start your creative journey with Canva. What will we design together today?\n\nI'll start working on your PowerPoint presentation for advocating sustainable practices in the bottled water industry. Here's a structured approach for each slide, based on your provided content:\n\n#### Slide 1: Title Slide\n**Title**: Advocating for Sustainable Practices in the Bottled Water Industry\n**Subtitle**: A Proposal to the Board of Directors of X-Corp\n**Presented by**: [Your Name], CEO\n**Date**: [Date]\n\n#### Slide 2: Opening Statement\n**Title**: Opening Statement\n**Content**: \n\"As the newly appointed CEO, I acknowledge the challenges we face in maintaining our operations while ensuring sustainable practices. It is our responsibility to adopt strategies that not only secure our company's future but also safeguard our environment and society.\n\n#### Slide 3: Current State Analysis\n**Title**: Environmental Impact of Water Extraction\n**Content**: \n- **Depletion of Aquifers**: Over-extraction leading to reduced water tables.\n- **Ecosystem Disruption**: Negative impacts on local flora and fauna.\n- **Water Scarcity**: Increased stress on already scarce water resources.\n**Visual**: Diagram showing the depletion of a water source over time.\n\n#### Slide 4: Externalized Costs to Society\n**Title**: Externalized Social Costs\n**Content**: \n- **Reduced Access**: Local communities facing reduced water availability.\n- **Health Impacts**: Increased waterborne diseases due to lower water quality.\n- **Economic Strain**: Higher costs for local residents and farmers.\n**Visual**: Chart comparing water availability before and after extraction.\n\n#### Slide 5: Economic Impacts\n**Title**: Economic Contributions vs. Costs\n**Content**: \n- **Revenue Generation**: Significant contribution to local and national economies.\n- **Employment**: Stable job opportunities provided by the industry.\n- **External Costs**: Environmental degradation and social costs not accounted for.\n**Visual**: A balance scale showing economic benefits on one side and external costs on the other.\n\n#### Slide 6: Life Cycle Sustainability Assessment (LCSA)\n**Title**: Life Cycle Sustainability Assessment\n**Content**: \n- **Stages**: Extraction, Bottling, Distribution, Disposal.\n- **Environmental Impact**: CO2 emissions, water use, waste generation.\n- **Areas for Improvement**: Efficient extraction, sustainable packaging, recycling initiatives.\n**Visual**: LCSA diagram with environmental impact at each stage.\n\n#### Slide 7: Process Chains and Inefficiencies\n**Title**: Current Process Chains\n**Content**: \n- **Extraction**: High water usage and inefficiencies.\n- **Bottling**: Energy-intensive processes.\n- **Distribution**: Significant carbon footprint.\n**Visual**: Flowchart highlighting points of inefficiency.\n\n#### Slide 8: Stock Flows and Sustainability\n**Title**: Stock Flows and Sustainability\n**Content**: \n- **Inflow**: Natural water sources.\n- **Outflow**: Bottled products, waste.\n- **Sustainability Issues**: Unsustainable inflow and outflow balance.\n**Visual**: Diagram showing inflow and outflow of

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a slide deck based on the attached document, structured according to the provided
outline/guideline for creating the presentation:\n\n---\n\n#### Slide 1: Title
Slide\n**Title**: Advocating for Sustainable Practices in the Bottled Water Industry
\n**Subtitle**: A Proposal to the Board of Directors of X-Corp \n**Presented by**:
[Your Name], CEO \n**Date**: [Date]\n\n---\n\n#### Slide 2: Opening
Statement\n**Title**: Opening Statement \n**Content**: \n"As the newly
appointed CEO, I acknowledge the challenges we face in maintaining our operations
while ensuring sustainable practices. It is our responsibility to adopt strategies
that not only secure our company&#x27;s future but also safeguard our environment and
society."\n\n---\n\n#### Slide 3: Current State Analysis\n**Title**: Environmental
Impact of Water Extraction \n**Content**: \n- **Depletion of Aquifers**: Over-
extraction leading to reduced water tables. \n- **Ecosystem Disruption**: Negative
impacts on local flora and fauna. \n- **Water Scarcity**: Increased stress on already
scarce water resources. \n**Visual**: Diagram showing the depletion of a water source
over time.\n\n---\n\n#### Slide 4: Externalized Costs to Society\n**Title**:
Externalized Social Costs \n**Content**: \n- **Reduced Access**: Local communities
facing reduced water availability. \n- **Health Impacts**: Increased waterborne
diseases due to lower water quality. \n- **Economic Strain**: Higher costs for local
residents and farmers. \n**Visual**: Chart comparing water availability before and
after extraction.\n\n---\n\n#### Slide 5: Economic Impacts\n**Title**: Economic
Contributions vs. Costs \n**Content**: \n- **Revenue Generation**: Significant
contribution to local and national economies. \n- **Employment**: Stable job
opportunities provided by the industry. \n- **External Costs**: Environmental
degradation and social costs not accounted for. \n**Visual**: A balance scale showing
economic benefits on one side and external costs on the other.\n\n---\n\n#### Slide 6:
Life Cycle Sustainability Assessment (LCSA)\n**Title**: Life Cycle Sustainability
Assessment \n**Content**: \n- **Stages**: Extraction, Bottling, Distribution,
Disposal. \n- **Environmental Impact**: CO2 emissions, water use, waste generation.
\n- **Areas for Improvement**: Efficient extraction, sustainable packaging, recycling
initiatives. \n**Visual**: LCSA diagram with environmental impact at each stage.\n\n
---\n\n#### Slide 7: Process Chains and Inefficiencies\n**Title**: Current Process
Chains \n**Content**: \n- **Extraction**: High water usage and inefficiencies. \n-
**Bottling**: Energy-intensive processes. \n- **Distribution**: Significant carbon
footprint. \n**Visual**: Flowchart highlighting points of inefficiency.\n\n---\n\n####
Slide 8: Stock Flows and Sustainability\n**Title**: Stock Flows and Sustainability
\n**Content**: \n- **Inflow**: Natural water sources. \n- **Outflow**: Bottled
products, waste. \n- **Sustainability Issues**: Unsustainable inflow and outflow
balance. \n**Visual**: Diagram showing inflow and outflow of resources.\n\n---\n\n####
Slide 9: Proposed Sustainability Measures\n**Title**: Sustainability Measures
\n**Content**: \n1. **Water Conservation Technologies**: Invest in efficient
extraction and recycling. \n2. **Alternative Water Sources**: Explore and utilize

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alternative sources. \n3. **Community Engagement**: Involve local communities in decision-making. \n4. **Eco-friendly Packaging**: Shift to biodegradable materials. \n5. **Carbon Footprint Reduction**: Optimize distribution to lower emissions. \n**Visual**: Icons representing each measure.\n\n---\n\n### Slide 10: Quantifying Benefits\n**Title**: Quantifying Benefits \n**Content**: \n- **Water Usage**: Reduction by 20% with new technologies. \n- **Carbon Emissions**: Decrease by 15% through optimized logistics. \n- **Cost Savings**: Long-term savings through sustainable practices. \n**Visual**: Bar graph showing projected improvements.\n\n---\n\n### Slide 11: Benefits and Outcomes\n**Title**: Benefits and Outcomes\n**Content**: \n- **Environmental**: Reduced impact on ecosystems, improved water quality. \n- **Social**: Better access to water for local communities, improved public health. \n- **Economic**: Lower operational costs, enhanced brand image, compliance with regulations. \n**Visual**: Summary chart of benefits.\n\n---\n\n### Slide 12: Call to Action\n**Title**: Call to Action \n**Content**: \n"By adopting these sustainability measures, we can lead our industry towards a more responsible and profitable future. I urge the Board to approve these initiatives, aligning with our corporate goals of profitability, sustainability, and social responsibility."\n\n---\n\n### Slide 13: Conclusion\n**Title**: Conclusion\n**Content**: \n"Together, we can make a significant impact on the environment, society, and our business. Let us commit to these changes for a sustainable future."\n\n---\n\n### Slide 14: Q&A\n**Title**: Questions & Answers\n**Content**: \n"Thank you for your attention. I am now open to any questions you may have."\n\n---\n\nThis slide deck presents a structured argument for the Board of Directors of X-Corp, advocating for sustainable practices within the bottled water industry. It outlines the environmental, social, and economic impacts, and proposes specific measures to enhance sustainability."], "status": "finished_successfully", "end_turn": null, "weight": 1.0, "metadata": {"request_id": "890d79f57f690d6a-MXP", "message_source": null, "timestamp": "absolute", "message_type": null}, "recipient": "all", "channel": null, "parent": "a1527505-d1e2-48b8-b132-b0a1ad0b11ab", "children": [{"id": "b871adcb-3e7e-454b-ad51-7e32085e522b"}], "b871adcb-3e7e-454b-ad51-7e32085e522b": {"id": "b871adcb-3e7e-454b-ad51-7e32085e522b", "message": {"id": "b871adcb-3e7e-454b-ad51-7e32085e522b", "author": {"role": "assistant", "name": null, "metadata": {}}, "create_time": 1717897901.071558, "update_time": null, "content": {"content_type": "code", "language": "json", "response_format_name": null, "text": "{"query": "PowerPoint presentation slides for sustainability in bottled water industry", "locale": "en-US"}"}, "status": "finished_successfully", "end_turn": false, "weight": 1.0, "metadata": {"citations": [], "gizmo_id": "g-alKfVrz9K", "finish_details": {"type": "stop", "stop_tokens": [200007]}}, "is_complete": true, "message_type": null, "model_slug": "gpt-4o", "default_model_slug": "gpt-4", "parent_id": "aaa25e73-336b-45fa-9df7-c3de76fe16d8", "request_id": "890d79f57f690d6a-MXP", "timestamp": "absolute", "recipient": "chatgpt_plugin_canva_com__jit_plugin.generateDesigns", "channel": null}, {"parent": "aaa25e73-336b-45fa-9df7-c3de76fe16d8", "children": [{"id": "0db15b12-b5c4-4036-bb73-8f4fb50c9854"}], "0db15b12-b5c4-4036-bb73-8f4fb50c9854": {"id": "0db15b12-b5c4-4036-bb73-8f4fb50c9854", "message": {"id": "0db15b12-b5c4-4036-bb73-8f4fb50c9854", "author": {"role": "tool", "name": "chatgpt_plugin_canva_com__jit_plugin.generateDesigns", "metadata": {}}, "create_time": 1717897901.071627, "update_time": 1717897898.1610107, "content": {"content_type": "text", "parts":

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["Create slides based on the information on the attachment and created to fit this
prompt: \n\nPart 2: Either through an electronic presentation (like PowerPoint or
Prezi) OR a video recorded speech, provide an argument as if you were the newly
appointed CEO of this industry\u2019s company, sent in to convince a Board of
Directors for X-Corp that it is in their best business interest to change their
industry behavior. Be specific, outline the limits of depletion, the externalized cost
to society, and the environmental impacts of the industry. Use models where
appropriate to show process chains, life cycle sustainability assessment or stock
flows. You may use local, regional, or global data or examples, but address the
industry as a whole. Present an initiative that highlights 5-10 sustainability
measures you are pitching to implement for the company. Qualify and quantify (if
possible) the outcomes, improvements, or targets you are advocating for. Communicate
effectively, as a leader, your argument for these measures to be implemented with the
Board\u2019s approval.\n\nLet the slides you create be informed by this
outline/guideline for creating the slide: \nTo incorporate the elements missing from
the written assignment into the presentation for Part 2, the following strategies can
be used effectively:\n\n1. **Introduction of Modeling and Concept Mapping**:\n -
**Process Chains**: Visualize the current operational process of water extraction,
bottling, and distribution using a flowchart or process diagram. Highlight points
where inefficiencies, excessive resource use, or environmental harm occur.\n -
**Life Cycle Sustainability Assessment (LCSA)**: Include a slide or segment that
discusses the full lifecycle of a bottled water product\u2014from resource extraction
to disposal. Use graphical representations to show the environmental impact at each
stage and propose where improvements can be implemented.\n - **Stock Flows**:
Utilize diagrams to show the inflow and outflow of resources (e.g., water sources,

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energy use, waste production). This can help illustrate how current practices might be unsustainable and how proposed changes can balance these flows for better sustainability.

Argument Structure for the Presentation

- Opening**: As the CEO, start by acknowledging the current challenges and the company's responsibility towards sustainable practices.
- Current State Analysis**: Briefly discuss the limits of depletion, externalized costs to society, and the environmental impacts using data and visuals from the written report. This sets the stage for the necessity of change.
- Sustainability Initiatives**: Introduce 5-10 specific sustainability measures. For each initiative, provide:
 - Description**: What the measure is and how it will be implemented.
 - Quantification**: If possible, offer data or projections on how this measure will reduce environmental impact, save costs, or improve efficiency.
 - Visuals**: Use charts, graphs, and models to make your case more compelling.
 - Benefits and Outcomes**: Summarize the overall benefits these changes will bring to the company, such as reduced operational costs, improved brand image, compliance with regulations, and long-term viability.
- Call to Action**: Conclude with a persuasive argument on why the Board should approve these initiatives, emphasizing the alignment with corporate goals like profitability, sustainability, and social responsibility.

Effective Communication as a Leader

- Confidence and Clarity**: Use clear and assertive language to convey the urgency and necessity of adopting sustainable practices.
- Engagement**: Ask rhetorical questions, use real-life examples, and relate the initiatives to the interests of the shareholders to keep them engaged.
- Professionalism**: Maintain a professional tone, use business-appropriate visuals, and ensure that the presentation is well-paced.

Technical and Design Considerations

- Choose a presentation tool that allows for dynamic content if possible, such as Prezi for visually engaging flowcharts or PowerPoint for structured slide decks.
- Make sure that visuals are high-quality and data-driven, avoiding overly complex diagrams that could confuse the audience.

By following these strategies, the presentation for Part 2 can effectively address the gaps from the written assignment, particularly in modeling and concept mapping, while persuasively arguing for sustainable changes in front of the Board of Directors.

distributed worldwide contributing to local economies through job creation and tax revenues. However the large-scale extraction of water raises concerns about the long-term sustainability of water resources necessitating a shift towards more sustainable practices (Spiliotopoulou & Roseland 2020).

Impact Assessment

Environmental Impacts

Bottled water companies like Sanpellegrino's operational practices particularly those surrounding large-scale water extraction from natural springs are critical to its production process. This substantial extraction is necessitated by the high demand for bottled water a trend that shows no signs of abating (Spiliotopoulou & Roseland 2020). However this practice raises significant concerns about the long-term sustainability of local water resources. Extracting such large volumes of water can deplete natural springs disrupt local ecosystems and exacerbate water scarcity issues particularly in regions already facing water stress (Spiliotopoulou & Roseland 2020).

In light of these concerns it is imperative for companies like Sanpellegrino to explore alternative water sources and implement more sustainable water management practices. This could include investing in water conservation technologies improving the efficiency of water extraction processes and engaging in corporate responsibility initiatives that prioritize environmental sustainability (Spiliotopoulou & Roseland 2020). By doing so Sanpellegrino can ensure its operations' sustainability while contributing to broader environmental conservation efforts.

Environmental impacts of the bottled water industry

include the depletion of aquifers reduced stream flows and degradation of aquatic ecosystems. Intensive water extraction can lead to declines in local water tables affecting both human use and ecosystem health (Cuoco et al. 2015). Furthermore the extraction process can disrupt the natural balance of aquatic ecosystems leading to biodiversity loss and habitat degradation (van Engelenburg et al. 2018)

In addition the extraction process affects the quantity and quality of water available in local streams and rivers. Reduced water flow can lead to higher concentrations of pollutants and increased water temperatures adversely affecting aquatic life. Lower water tables can result in reduced soil moisture impacting local agriculture and vegetation (Bartolini et al. 2007; Ferragina 2010).

The ecological consequences of water extraction are further compounded by the reduced ability of the environment to recharge depleted aquifers. Natural recharge processes are often slower than the extraction rate leading to long-term sustainability issues. Over time this imbalance can result in permanent changes to the local ecosystem including the loss of biodiversity and the degradation of natural habitats (van Engelenburg et al. 2018).

Social Impacts

The social impacts of water bottling operations are significant affecting local communities in various ways. One of the most pressing social issues is the reduced access to water for local communities. As companies like Sanpellegrino extract vast quantities of water local residents often find their wells drying up or experiencing reduced water pressure. This can lead to conflicts over water use particularly in regions where water is already scarce (Ostrom 1998). While the water bottling industry generates substantial revenue the economic benefits often do not extend to local populations. Residents may face increased costs for water and might need to purchase bottled water for their own use effectively buying back their own resources at a premium price (Manzellaa et al. 2018).

Reduced water availability has significant health implications. Lower water quality can lead to a higher incidence of waterborne diseases impacting public health. Additionally reduced water availability affects agriculture a primary livelihood for many residents. Farmers may experience lower crop yields and increased difficulty maintaining livestock further

exacerbating economic inequalities (D'ippoliti et al. 2015).

Economic Impacts

The economic impacts of the water bottling industry present a complex picture of benefits and costs (Bartolini et al. 2007). While the industry contributes to national economies by generating substantial revenue through taxes and employment it also incurs external costs related to environmental degradation and social issues (Bartolini et al. 2007; Sanpellegrino 2023). For instance Sanpellegrino a major player in the industry reported revenues of over one billion Euros in 2022 significantly contributing to local and national economies (Sanpellegrino 2023). Moreover the bottling industry provides stable employment opportunities which can significantly benefit regions with limited job prospects. Sanpellegrino alone employs thousands of workers in its facilities and Bartolini et al. (2007) underscored the far-reaching effects of such employment opportunities. The study highlighted the positive implications of stable job opportunities provided by companies like Sanpellegrino supporting individuals and families with reliable incomes and stimulating local economic activity through increased consumer spending investment and tax revenues (Bartolini et al. 2007).

However external costs such as environmental degradation and social costs are not typically accounted for in the industry's economic benefits. Local governments may incur additional expenses in managing water resources addressing health impacts and mitigating environmental damage caused by over-extraction (Cuoco et al. 2015). Such realities highlight the need to comprehensively assess the water bottling industry's economic impacts considering its benefits and external costs.

Regulatory Frameworks and Policy Analysis

The regulatory landscape in Italy and the European Union is oriented towards the sustainable management of water resources. However there is a need for greater consistency in enforcement and effectiveness. Current legislation and policies often prioritize corporate interests over public and environmental health. For instance while regulations such as the Water Framework Directive (Directive 2000/60/EC) aim to safeguard water resources and foster sustainable water management practices there are discernible inconsistencies in enforcement and regulatory gaps that have the potential to compromise these objectives thus enabling companies like Sanpellegrino to continue extracting water at unsustainable rates (Aukidy et al. 2012). To address these challenges it is essential to introduce more stringent regulatory measures. This could involve the implementation of tighter water extraction limits and the enforcement of compliance through regular monitoring consequently contributing to the protection of water resources. Furthermore the involvement of local communities in decision-making processes concerning water resource management is crucial as it ensures that their needs and rights are duly considered (Bartolini et al. 2007). If meticulously employed these approaches may prove instrumental in amplifying the efficacy of existing regulations and driving meaningful change in the sustainable management of water resources within Italy and the European Union.

Recommendations for Sustainable Practices

A comprehensive strategy is essential to address the significant environmental impacts associated with the water bottling industry. Firstly as previously discussed stricter regulatory measures are necessary to mitigate these impacts. This entails imposing more rigorous limits on water extraction and ensuring compliance through continuous monitoring (Spiliotopoulou & Roseland 2020). These regulations should be based on scientific evaluations of sustainable extraction rates.

Secondly community engagement in decision-making processes related to water resource management is crucial. As proposed by Spiliotopoulou and Roseland (2020) and grounded in the principles of Ostrom (1998) community-based water management models

have been shown to balance corporate interests and public needs effectively. A more equitable distribution of resources can be achieved by actively involving residents businesses and other stakeholders in water management decisions. Thirdly companies should invest significantly in conservation technologies including developing methods for recycling and reusing water within bottling plants. This approach can reduce water usage and enhance the efficiency of water extraction processes (Spiliotopoulou & Roseland 2020). The incorporation of these advanced technologies not only demonstrates a commitment to sustainable practices but also aligns with the growing societal and environmental expectations for corporate responsibility and stewardship. Therefore companies that invest in these conservation technologies are better positioned to minimize their environmental footprint and positively impact their operational costs and long-term sustainability. Furthermore corporate environmental responsibility initiatives must be prioritized within the business world. Companies like Sanpellegrino must lead in promoting environmental sustainability and social equity. For example they could consider allocating resources to funding local water conservation projects and supporting infrastructure improvements (Bae & Kim 2022). This kind of proactive approach not only benefits the environment but also positively impacts the communities in which these companies operate. Employing a multi-faceted approach to address environmental impacts by implementing rigorous regulations engaging with communities fostering technological innovation and promoting corporate responsibility initiatives is paramount (Spiliotopoulou & Roseland 2020; McNabb 2019; Bae & Kim 2022). This approach can substantially contribute to the sustainable management of water resources advocating for environmental sustainability and social equity. Additionally analyzing the water bottling industry's environmental social and economic impacts highlights the broader implications of treating water as a commercial commodity. By reorienting the management of water resources to prioritize sustainability and equity we can ensure the long-term health of both the environment and local communities. Achieving this objective requires a collaborative effort among corporations governments and communities to develop and implement strategies that harmonize economic benefits with environmental and social responsibilities.

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diseases due to lower water quality. \n- **Economic Strain**: Higher costs for local residents and farmers. \n**Visual**: Chart comparing water availability before and after extraction.\n\n---\n\n#### Slide 5: Economic Impacts\n**Title**: Economic Contributions vs. Costs \n**Content**: \n- **Revenue Generation**: Significant contribution to local and national economies. \n- **Employment**: Stable job opportunities provided by the industry. \n- **External Costs**: Environmental degradation and social costs not accounted for. \n**Visual**: A balance scale showing economic benefits on one side and external costs on the other.\n\n---\n\n#### Slide 6: Life Cycle Sustainability Assessment (LCSA)\n**Title**: Life Cycle Sustainability Assessment \n**Content**: \n- **Stages**: Extraction, Bottling, Distribution, Disposal. \n- **Environmental Impact**: CO2 emissions, water use, waste generation. \n- **Areas for Improvement**: Efficient extraction, sustainable packaging, recycling initiatives. \n**Visual**: LCSA diagram with environmental impact at each stage.\n\n---\n\n#### Slide 7: Process Chains and Inefficiencies\n**Title**: Current Process Chains \n**Content**: \n- **Extraction**: High water usage and inefficiencies. \n- **Bottling**: Energy-intensive processes. \n- **Distribution**: Significant carbon footprint. \n**Visual**: Flowchart highlighting points of inefficiency.\n\n---\n\n#### Slide 8: Stock Flows and Sustainability\n**Title**: Stock Flows and Sustainability \n**Content**: \n- **Inflow**: Natural water sources. \n- **Outflow**: Bottled products, waste. \n- **Sustainability Issues**: Unsustainable inflow and outflow balance. \n**Visual**: Diagram showing inflow and outflow of resources.\n\n---\n\n#### Slide 9: Proposed Sustainability Measures\n**Title**: Sustainability Measures \n**Content**: \n1. **Water Conservation Technologies**: Invest in efficient extraction and recycling. \n2. **Alternative Water Sources**: Explore and utilize alternative sources. \n3. **Community Engagement**: Involve local communities in decision-making. \n4. **Eco-friendly Packaging**: Shift to biodegradable materials. \n5. **Carbon Footprint Reduction**: Optimize distribution to lower emissions. \n**Visual**: Icons representing each measure.\n\n---\n\n#### Slide 10: Quantifying Benefits\n**Title**: Quantifying Benefits \n**Content**: \n- **Water Usage**: Reduction by 20% with new technologies. \n- **Carbon Emissions**: Decrease by 15% through optimized logistics. \n- **Cost Savings**: Long-term savings through sustainable practices. \n**Visual**: Bar graph showing projected improvements.\n\n---\n\n#### Slide 11: Benefits and Outcomes\n**Title**: Benefits and Outcomes \n**Content**: \n- **Environmental**: Reduced impact on ecosystems, improved water quality. \n- **Social**: Better access to water for local communities, improved public health. \n- **Economic**: Lower operational costs, enhanced brand image, compliance with regulations. \n**Visual**: Summary chart of benefits.\n\n---\n\n#### Slide 12: Call to Action\n**Title**: Call to Action \n**Content**: \n"By adopting these sustainability measures, we can lead our industry towards a more responsible and profitable future. I urge the Board to approve these initiatives, aligning with our corporate goals of profitability, sustainability, and social responsibility."\n\n---\n\n#### Slide 13: Conclusion\n**Title**: Conclusion \n**Content**: \n"Together, we can make a significant impact on the environment, society, and our business. Let us commit to these changes for a sustainable future."\n\n---\n\n#### Slide 14: Q&A\n**Title**: Questions & Answers \n**Content**: \n"Thank you for your attention. I am now open to any questions you may have."\n\n---\n\nThis slide deck presents a structured argument for the Board of Directors of X-Corp, advocating for sustainable practices within the bottled water industry. It outlines the environmental, social, and economic impacts, and

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proposes specific measures to enhance sustainability."}], "status":
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considered a plant management measure, as it can physically remove the targeted plants
quickly and efficiently. Few empirical studies have examined the effects of harvesting
on water quality or the aquatic plant community in a complete lake ecosystem. A large
area (196 km<sup>2</sup>) of floating-leaved Nymphoides peltata was harvested in Lake Taihu in
2013. The effects of harvesting on the coverage and biomass of N. peltata and on the
submerged plant community were evaluated. The quantities of nitrogen and phosphorus
removed by harvesting were calculated. Harvesting caused an immediate reduction in N.
peltata coverage, and its coverage in the following year ranged from 29.2% to 95.1%.
Wave conditions and interspecific competition were the main factors that influenced
the response of the submerged plant community to N. peltata harvesting. Harvesting may
favor the dominance of Hydrilla verticillata, which expands quickly at an average
growth rate of 53 \u00b1 14 g m<sup>-2</sup> day<sup>-1</sup>. Harvesting a large amount of N.
peltata has a positive effect on total nitrogen (TN), ammonium nitrogen (NH<sub>3</sub>-N), and
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for rainfed agriculture or water supply for households. Unfortunately, rainwater might be polluted by bacteria and hazardous chemicals requiring treatment before usage. Slow sand filtration and solar technology are methods to reduce the pollution.

Membrane technology would also be a potential disinfection technique for a safe drinking water supply. ", "paper_authors": [\"B.

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 harvesting systems have improved productivity in various regions in sub-Saharan Africa.
 Similarly, they can help retain water in landscapes, build resilience against droughts
 and dry spells, and thereby contribute to sustainable agricultural intensification.
 However, there is no strong empirical evidence that shows the effects of
 intensification of water harvesting on upstream-downstream social-ecological systems
 at a landscape scale. In this paper we develop a decision support system (DSS) for
 locating and sizing water harvesting ponds in a hydrological model, which enables
 assessments of water harvesting intensification on upstream-downstream ecosystem
 services in meso-scale watersheds. The DSS was used with the Soil and Water Assessment
 Tool (SWAT) for a case-study area located in the Lake Tana basin, Ethiopia. We found
 that supplementary irrigation in combination with nutrient application increased
 simulated teff (*Eragrostis tef*, staple crop in Ethiopia) production up to three times,
 compared to the current practice. Moreover, after supplemental irrigation of teff, the
 excess water was used for dry season onion production of 7.66 t/ha (median). Water
 harvesting, therefore, can play an important role in increasing local- to regional-
 scale food security through increased and more stable food production and generation
 of extra income from the sale of cash crops. The annual total irrigation water
 consumption was ~4%-30% of the annual water yield from the entire watershed. In
 general, water harvesting resulted in a reduction in peak flows and an increase in low
 flows. Water harvesting substantially reduced sediment yield leaving the watershed.
 The beneficiaries of water harvesting ponds may benefit from increases in agricultural
 production. The downstream social-ecological systems may benefit from reduced food
 prices, reduced flooding damages, and reduced sediment influxes, as well as
 enhancements in low flows and water quality. The benefits of water harvesting warrant
 economic feasibility studies and detailed analyses of its ecological
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 coupled with climate change require maximizing the use of available resources. Water
 harvesting (WH) systems are currently being used in many areas to sustain crops and
 increase water productivity. This study investigated the effect of three treatments
 (S15: 50-m² catchment area with 15% slope, S8: 50-m² catchment area with 8% slope, and
 L8: 70-m² catchment area with 8% slope) on the amount of water harvested in tree basin
 for young olive (*Olea europaea* L.) trees from November 2002 to July 2003. Soil
 moisture was monitored weekly during the rainy season and bi-weekly afterwards. To

determine moisture changes in the catchment and target areas and amount of water harvested (in liters) for each tree, volumetric soil moisture content was measured at three or four points along the slope using a neutron probe down to a maximum depth of 120cm, as soil depth allowed.

“A. Tubeileh, A. Bruggeman, F. Turkelboom”, 2016, *publication_journal_name*: *Agricultural Water Management*, *consensus_paper_details_url*: https://consensus.app/papers/waterharvesting-designs-fruit-production-environments-tubeileh/b9450ff3802f5a3b98163cf9e2c9963a/?utm_source=chatgpt&doi=10.1016/J.AGWAT.2015.11.006&volume=165&pages=190-197&search_result_number=6, *paper_title*: “Mechanical shredding of water hyacinth (*Eichhornia crassipes*): Effects on water quality in the Sacramento-San Joaquin River Delta, California”, *abstract*: “Management actions to control invasive aquatic species can have significant ecosystem-scale effects. We evaluated the water chemistry and nutrient effects of mechanical shredding to control water hyacinth (*Eichhornia crassipes*) in an agricultural slough and a tidal wetland on the Sacramento-San Joaquin River Delta, California. Shredding was conducted with two types of shredder boats in fall of 2003 and another boat in spring of 2004. Shredding measurably affected water quality, but specific effects varied as a function of shredding site and season. Significant increases were observed for total Kjeldahl nitrogen and total phosphorus for all experiments. Dissolved oxygen effects varied by site, decreasing after shredding at the agricultural slough but increasing at the tidal wetland. The increase in dissolved oxygen likely resulted from tidal incursions from the adjacent river. A year-long time series of dissolved oxygen data indicated a negative relationship between hyacinth abundance and dissolved oxygen concentrations. Hyacinth contained similar tissue concentrations of mercury to underlying sediments, suggesting that plant harvesting could aid mercury remediation efforts. Simple mass calculations indicated that Delta-wide shredding operations could cause between 0.1% and 9.6% increases in the overall abundance of carbon, nitrogen, and phosphorus in the Delta water column. Results suggest that local effects of management actions to control invasive aquatic plants will vary widely as a function of site-specific hydrology, but that estuary-wide effects would be limited.”

“B. K. Greenfield, G. Siemering, J. Andrews, M. Rajan, S. P. Andrews”, 2007, *publication_journal_name*: *Estuaries and Coasts*, *consensus_paper_details_url*: https://consensus.app/papers/shredding-water-hyacinth-eichhornia-crassipes-effects-greenfield/3c77f07d4c965e0da75d9e9f7726eb8c/?utm_source=chatgpt&doi=10.1007/BF02841960&volume=30&pages=627-640&search_result_number=7, *paper_title*: “Neutral electrolyzed oxidizing water is effective for pre-harvest decontamination of fresh produce.”

“Pre-harvest sanitization of irrigation water has potential for reducing pathogen contamination of fresh produce. We compared the

resources. Rainwater harvesting (RWH) for groundwater recharge is seen as one of the solutions to solve the groundwater problem. This is reflected in an increase in watershed development programs, in which RWH is an important structural component. Understanding the net effect of these development programs is crucial to ensure that net effect on groundwater is positive both locally and within a watershed. Hence, this review focuses on the hydrological impacts of RWH for recharge at the local (individual structure) and watershed scale in rural areas. Surprisingly little field evidence of the stated positive impacts at the local scale is available, and there are several potential negative impacts at the watershed scale. The watershed scale is underrepresented in the field studies and is mainly approached through modelling. Modelling is seen as a possible tool to extend limited field data and scenario studies can be used to examine potential impacts. However, many past modelling studies examining RWH have either had limited focus or have been based on insufficient data. Development of new modelling tools is needed in combination with increased field data collection. Increased use of remote sensing and advanced statistical techniques are suggested as possible new opportunities. In addition, some evaluation criteria are proposed to assess the local and watershed scale hydrological, and other, impacts of RWH as part of watershed development. "C. Glendenning"; "F. V. Ogtrop"; "A. Mishra"; "R. Vervoort";], "paper_publish_year";2012, "publication_journal_name"; "Agricultural Water

Management"; "consensus_paper_details_url"; "https://consensus.app/papers/balancing-watershed-scale-impacts-rain-water-harvesting-glendenning/ad058fc851d85ad9ad458b9088651a95/?utm_source=chatgpt"; "doi"; "10.1016/J.AGWAT.2012.01.011"; "volume"; "107"; "pages"; "1-

13"; "search_result_number";10}, {"paper_title"; "Comparison of the microbiological and chemical characterization of harvested rainwater and reservoir water as alternative water

resources."; "abstract"; "Rainwater harvesting (RWH) offers considerable potential as an alternative water supply. In this study, all of the harvested rainwater samples met the requirements for grey water but not for drinking water. In terms of microbiological parameters, total coliform (TC) and Escherichia coli (EC) were measured in 91.6% and 72%, respectively, of harvested rainwater samples at levels exceeding the guidelines for drinking water, consistent with rainfall events. In the case of the reservoir water samples, TC and EC were detected in 94.4% and 85.2%, respectively, of the samples at levels exceeding the guidelines for drinking water. Both indicators gradually increased in summer and fall. The highest median values of both TC and EC were detected during the fall. Chemical parameters such as common anions and major cations as well as metal ions in harvested rainwater were within the acceptable ranges for drinking water. By contrast, Al shows a notable increase to over 200µg/L (-) in the spring due to the intense periodic dust storms that can pass over the Gobi Desert in northern China. In terms of statistical analysis, the harvested rainwater quality showed that TC and EC exhibit high positive correlations with NO₃(-) (rho(TC)=0.786 and rho(EC)=0.42) and PO₄(-) (rho(TC)=0.646 and rho(EC)=0.653), which originally derive from catchment contamination, but strong negative correlations with Cl(-) (rho(TC)=-0.688 and rho(EC)=-0.484) and Na(+) (rho(TC)=-0.469 and rho(EC)=-0.418), which originate from seawater."; "paper_authors"; "J. Y. Lee"; "Jung-Seok

Yang", "Mooyoung Han", "Jaeyoung Choi"], "paper_publish_year"::2010, "publication_journal_name"::"The Science of the total environment", "consensus_paper_details_url"::"https://consensus.app/papers/comparison-chemical-characterization-harvested-water-lee/815dab45dca751c99cf8bdf57186b643/?utm_source=chatgpt", "doi"::"10.1016/j.scitotenv.2009.11.001", "volume"::"4084", "pages"::"896-905\\n", "search_result_number"::11}, {"paper_title"::"Effects of timber harvest on water quantity and quality in small watersheds in the Piedmont of North Carolina", "abstract"::"This paired watershed study tested the effects of timber harvest on water quantity and quality in the North Carolina Piedmont physiographic region. Four headwater watersheds at Hill Demonstration Forest (HF1, HF2, HFW1, and HFW2) and two at Umstead Research Farm (UF1 and UF2) were continuously monitored for discharge and water quality from 2007 to 2013. The HF1 and UF1 watersheds were clearcut (treatment), leaving a 15.2-m vegetated riparian buffer around the streams to protect water quality as described in the North Carolina Neuse River Basin Riparian Buffer Rule. HF2 and UF2 were uncut and used as reference watersheds. Merchantable timber was selectively removed from the riparian buffer, reducing tree basal area by 27% in HF1 and 48% in UF1. HF1 and HF2 were nested within HFW1; thus, HFW1 was considered a partial cut where 33% of the watershed area was harvested, and HFW2 was the reference. We found that discharge in treatment watersheds increased dramatically, averaging 240% in HF1 and 200% in UF1 and 40% in HFW1 during the postharvest period, 2011\u20132013. Total suspended sediment export in the treatment watersheds also increased significantly in HF1 after harvest, probably due to the increase of discharge and movement of in-channel legacy sediment. Stormflow peak nitrate reached its maximum concentration during the first 2 years after harvest in the treatment watersheds and then declined, corresponding to the rapid regrowth of woody and herbaceous plants in the riparian buffer and uplands. We found that 36% of the UF1 streambank trees were blown down but did not cause a measurable increase in mean daily stormflow total suspended sediment concentration. Most buffer tree blowdown occurred during the first few years after a harvest. Bioclassification of benthic macroinvertebrates indicated that stream water quality remained good/fair to excellent in the treatment watersheds after the harvest. We conclude that the temporary increases in discharge were relatively large for the Piedmont region compared with those for other regions in the southeastern United States. However, the increases in channel sediment transport and nutrient exports associated with the hydrologic change did not have a measurable impact on the indicators of aquatic invertebrate community health or bioclassification rankings.", "paper_authors"::["J. Boggs", "G. Sun", "McNulty"], "paper_publish_year"::2016, "publication_journal_name"::"Journal of Forestry", "consensus_paper_details_url"::"https://consensus.app/papers/effects-timber-water-quantity-quality-watersheds-boggs/83a30d7af5cf5dceb419efe67887b55b/?utm_source=chatgpt", "doi"::"10.5849/JOF.14-102", "volume"::"114", "pages"::"27-40", "search_result_number"::12}, {"paper_title"::"The effects of tree harvesting on stream-water quality at an acidic and acid-sensitive

spruce forested area: Plynlimon, mid-Wales";"abstract";"Abstract

The effects of a 3 year conifer harvesting programme on stream-water quality are described for the acidic and acid-sensitive Afon Hore catchment. Nitrate and potassium concentrations, initially almost quadrupled, have remained high for 4 years from the commencement of the harvesting programme. For the undisturbed (control) system, the fluctuations are small and peak during the winter months. With harvesting, a phase change takes place and peak concentrations occur during the autumn period. A similar pattern, but with no phase shift, is observed for dissolved organic matter, although concentrations increase less: peak concentrations occur during the summer to autumn periods. During the first 2 years of felling, aluminium concentrations increase in the winter period: after that, concentration differences are much smaller. During the summer base-flow period, alkalinity and calcium values decrease. Sodium and chloride concentrations increase with time owing to a corresponding increase in the rainfall input. This trend is not observed for the stream in the felled catchment. For sulphate, there is a general decline in concentration for both the control and felled areas. With felling, a seasonal pattern has been introduced: the lowest concentrations occur in winter. The results are interpreted in terms of: (1) reduced atmospheric scavenging of sea salt and sulphur due to the loss of the trees; (2) increased losses of the nutrients from the soils due to reduced uptake by the vegetation; (3) increased aluminium releases from the soil's cation exchange store following increased total inorganic anion concentrations resulting from nitrate generation from (2); (4) a reduced contribution of ground water to the stream or an increased acidification of the ground water. The results are discussed in relation to environmental and water management issues. Nitrate production will probably not be of importance to either, owing to the low levels found in the stream. The increase in aluminium may extend the length of the stream where less favourable biological conditions prevail. There are potential water treatment problems for sensitive catchments due to manganese, dissolved organic carbon (colour), bromide and iodide generation during deforestation.";"paper_authors";"[";C. Neal";";R. Fisher";";Chris Smith";";S. Hill";";M. Neal";";T. Conway";";G. Ryland";";H. Jeffrey";",";paper_publish_year";":1992,";publication_journal_name";":";Journal of Hydrology";";";consensus_paper_details_url";";";https://consensus.app/papers/effects-tree-harvesting-streamwater-quality-spruce-neal/265fc85fc3a655729fad387b8becd624/?utm_source=chatgpt";";";doi";";";10.1016/0022-1694(92)90093-B";";";volume";";";135";";";pages";";";305-319";";";search_result_number";";13}, {";paper_title";";";Effects of fungal-assisted algal harvesting through biopellet formation on pesticides in water";";";abstract";";";Recent research has demonstrated the potential of using filamentous fungi to form pellets with microalgae (biopellets), in order to facilitate harvesting of microalgae from water following algae-based treatment of wastewater. In parallel, there is a need to develop techniques for removing organic pollutants such as pesticides and pharmaceuticals from wastewater. In experiments using the microalga *Chlorella vulgaris*, the filamentous fungus *Aspergillus niger* and biopellets composed of these microorganisms, this study investigated whether fungal-assisted algal harvesting can also remove pesticides from contaminated water. A mixture of 38 pesticides was tested and the concentrations of 17 of these were found

to be reduced significantly in the biopellet treatment, compared with the control. After harvesting, the concentration of total pesticides in the algal treatment did not differ significantly from that in the control. However, in the fungal treatment and biopellet treatment, the concentration was significantly lower (59.6\2009\200b1\20092.0\200a0\200b5g/L and 56.1\2009\200b1\20092.8\200a0\200b5g/L, respectively) than in the control (66.6\2009\200b1\20091.0\200a0\200b5g/L). Thus fungal-assisted algal harvesting through biopellet formation can also provide scope for removing organic pollutants from wastewater, with removal mainly being performed by the fungus.

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microstructures with heightened water accumulating ability are typically affixed onto atmospheric water harvesters. However, due to this surface morphology type harvester design, there is an inherent partition of regions with different water accumulating abilities; the active water harvesting region (AWHR) and passive water harvesting region (PWHR). Most of the water harvested by such water harvesters are usually attributed to the AWHR, while a large amount of uncollected water is present in the PWHR as numerous small water droplets which are prone to re-evaporation. This lack of PWHR utilization may be considered as the Achilles' heel towards optimal water harvesting. Hence, in this work, a cascading effect was proposed with a microstructure design to induce water harvesting from both AWHR and PWHR. The "clearing" of PWHR columns was demonstrated via a cascading effect, contributing to ca. three times more water harvested as compared to the unmodified water harvester. The successful demonstration of this cascading effect highlights the necessity of considering PWHR in the future water harvester designs so as to achieve efficient water harvesting.

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Harvesting in Dry Environments", "abstract": "As water shortage in the dry areas is a recurrent crisis, people have a great need for information on how to capture and use every available drop of water efficiently. Water harvesting is an effective and economical means of achieving this objective and information on its various systems and techniques is in great demand. Water harvesting has been practiced successfully for millennia in parts of the world and some recent interventions have also had significant local impact. Yet water harvesting's potential remains largely unknown, unacknowledged and unappreciated. Water harvesting offers under-exploited opportunities for the predominantly rainfed farming systems of the drylands in the developing world. It works best in precisely those areas where rural poverty is worst. When practiced well, its impact is to simultaneously reduce hunger and alleviate poverty, as well as to improve the resilience of the environment. Rainfall is the most important natural resource in drier environments. Low rainfall, water scarcity and land degradation severely inhibit the production capacities of agricultural lands in arid and semiarid environments. Improving the efficiency of rainwater use is, therefore, extremely critical in these water-scarce areas with rapidly expanding, poor populations living in a fragile environment and facing food insecurity and depleted natural resources bases. Water harvesting is increasingly important for improving the management of water resources in such dry environments. This chapter deals with the methods and techniques of water harvesting to make more water available to humans, animals and for irrigation purposes, in places where rainwater is the only source of water. Details are provided on the main factors for selection of reliable water harvesting technique that is sustainable under local circumstances, including physical (hydrologic, terrain, and technical), cultural acceptability and socioeconomic (institutional and economic) factors. The aim is to

compile a synthesis of experiences that can provide insight into rainwater harvesting opportunities which address human wellbeing while continuing to sustain a range of ecosystem services. ""paper_authors"":["A. Yazar","Akhtar Ali"],"paper_publish_year":2016,"publication_journal_name":"Consensus Paper","consensus_paper_details_url":"https://consensus.app/papers/water-harvesting-environments-yazar/3b70506eef8550df8e381b5923a48b5d/?utm_source=chatgpt","doi":"10.1007/978-3-319-47928-6_3","volume":"","pages":"49-98","search_result_number":17}, {"paper_title":"Effects of *Typha latifolia* transpiration and harvesting on nitrate concentrations in surface water of wetland microcosms","abstract":"Abstract This experiment tested the hypothesis that the movement of water into the soil due to macrophyte transpiration stimulates nitrate removal from wetlands. The short-term impacts of biomass harvesting upon the ability of wetlands to reduce nitrate concentrations were also investigated. Different amounts of biomass were harvested from *Typha latifolia* specimens to create three treatments of varying transpiration rates. Harvesting and the resulting different rates of transpiration explained between 10 and 38% of the variation in nitrate reduction during the 10-day experiment and had significant effects upon nitrate concentrations. Greater rates of harvesting and lower rates of transpiration resulted in decreased reductions of nitrate in the surface water of the microcosms. During the first four days of the experiment, 70% and 85% rates of aboveground harvesting reduced transpiration by 63% and 91%, respectively. These changes led to respective decreases in nitrate reduction of 16% and 31% compared to unharvested treatments. Differences in nitrate reduction between the treatments were minimal in the later days of the experiment as nitrate concentrations decreased. Results support the hypothesis that water movement due to plant uptake contributes, to nitrogen removal and offers a partial explanation for increased nitrogen removal in vegetated wetland treatment systems. Decreased reduction of nitrate with greater harvesting demonstrates potential negative impacts on water quality improvement when using wetlands as bio-energy production systems.","paper_authors":["Jay F. Martin","Elizabeth C. Hofherr","M. Quigley"],"paper_publish_year":2003,"publication_journal_name":"Wetlands","consensus_paper_details_url":"https://consensus.app/papers/effects-of-typha-transpiration-harvesting-martin/20d6aca2e1345d1e9d0013da78db70b7/?utm_source=chatgpt","doi":"10.1672/0277-5212(2003)023[0835:EOTLTA]2.0.CO;2","volume":"23","pages":"835-844","search_result_number":18}, {"paper_title":"Long-term monitoring of soil fertility for agroforestry combined with water harvesting in Central Chile","abstract":"Agroforestry associated with water harvesting was evaluated in field experiments conducted in central Chile, 1996-2013. Soil fertility parameters, such as soil organic matter (SOM), soil reaction (pH), total nitrogen (NT), total phosphorus (PT) and total potassium (KT) contents were measured for five different treatments: control (C), agroforestry (A), agroforestry with water harvesting (AR), woody perennial (W) and woody perennial with water harvesting (WR). *Acacia saligna* was used as the woody perennial component.

Treatments, including *Acacia saligna* (A, AR, W and WR) increased SOM and NT stocks over time compared with the control, probably due to higher SOM and N inputs from the litter and root turnover. The treatments with water harvesting (AR and WR) showed the highest SOM and NT contents by 2008, suggesting that this practice had positive effects on water infiltration rates and soil water content in the soil, important parameters in the process of root turnover. However, there were no significant differences in other soil parameters, such as pH, PT and KT, perhaps due to the short study time, and soil spatial and temporal variability between treatments.

Salazar, O. Seguel, F. Villarreal, C. Leiva, *Archives of Agronomy and Soil Science*, 2012, https://consensus.app/papers/longterm-monitoring-soil-fertility-agroforestry-casanova/00f6bbca020857198b945cd67a2814f5/?utm_source=chatgpt&doi=10.1080/03650340.2012.696775, volume 58, pages S165 - S169, search_result_number: 19, {paper_title: Evaluation of climate change impacts on rainwater harvesting}, abstract: Abstract Water management is an important issue in urban design due to the growing concern of water scarcity. As a result, rainwater harvesting system has received notable attention as an alternative water source. Rainwater is one of purest form of waters and can easily be accessed via a rainwater harvesting system. In general, performance of a rainwater harvesting system is estimated based on historical rainfall data without the possible impacts of climate change on rainfall. However, rainfall pattern is likely to change in the future as a consequence of climate change that may affect the performance of a rainwater harvesting system. But research on climate change impacts on rainwater harvesting is limited. The objective of this study is to understand the plausible impacts of climate change on the performances (i.e. water savings, reliability and water security) of a residential rainwater harvesting system, based on the projected future rainfall conditions. A continuous daily simulation water balance model is developed based on behavioural analysis and yield-after-spillage criteria to simulate the performances of a rainwater harvesting system. The analysis is conducted at five locations in the Greater Sydney region, Australia. The results indicate that performances of a rainwater harvesting system will be impacted negatively due to climate change conditions in the future. It is found that a given tank size at the selected locations would not be able to supply expected volume of water under changing climate conditions in future. Water savings is going to be reduced from a rainwater harvesting system in future (e.g. 2% reduction for 3000L tank for indoor water demand). Moreover, number of days in a year to meet the water demand by a rainwater harvesting system (i.e. reliability) is likely to be reduced (e.g. 3% reduction for 3000L tank for indoor water demand). Also, the percentage of days a rainwater tank would remain completely empty is likely to increase in future (e.g. 12% in future climate conditions in comparison to 8% in historical conditions for indoor water demand). Furthermore, it is found that the performance of a rainwater harvesting system will be more affected in dry season than the wet season. The findings of the study will help water authorities and policy makers, as well the home owners to

improve their understanding of climate change impact on residential rainwater harvesting system, and will assist them in selecting appropriate rainwater tank size in the context of climate change. "paper_authors": ["M. Haque", "Ataur Rahman", "B. Samali"], "paper_publish_year": 2016, "publication_journal_name": "Journal of Cleaner Production", "consensus_paper_details_url": "https://consensus.app/papers/evaluation-climate-change-impacts-rainwater-harvesting-haque/0b158f290222503f83fd06c2b06754f8/?utm_source=chatgpt", "doi": "10.1016/J.JCLEPRO.2016.07.038", "volume": 137, "pages": 60-69, "search_result_number": 20}], "status": "finished_successfully", "end_turn": null, "weight": 1.0, "metadata": {"invoked_plugin": {"type": "remote", "namespace": "chat_consensus_app__jit_plugin", "plugin_id": "g-f1286ecb04957580332cda9bf386b57ef1b2ed6f", "http_response_status": 200}, "jit_plugin_data": {"from_server": {"type": "preview", "body": {"domain": "chat.consensus.app", "is_consequential": false, "privacy_policy": "https://consensus.app/home/privacy-policy/", "method": "get", "path": "/quick_search", "operation": "search_papers", "params": {"query": "San Pellegrino water harvesting negative effects"}, "actions": []}}, "gizmo_id": "g-bo0FiWLY7", "message_type": null, "model_slug": "gpt-4o", "default_model_slug": "gpt-4", "pad": "AAAAAAAAAAAAAAAAAAAA", "parent_id": "eeee5345-7996-4455-9909-59346a8745c5", "request_id": "890beeb27ea80e27-MXP", "timestamp": "absolute", "recipient": "all", "channel": null}, "parent": "eeee5345-7996-4455-9909-59346a8745c5", "children": [{"id": "1f0e2202-f6ea-4690-a93f-f33c22ad182f"}, {"id": "1f0e2202-f6ea-4690-a93f-f33c22ad182f": {"id": "1f0e2202-f6ea-4690-a93f-f33c22ad182f", "message": {"id": "1f0e2202-f6ea-4690-a93f-f33c22ad182f", "author": {"role": "assistant", "name": null, "metadata": {}}, "create_time": 1717881718.214409, "update_time": null, "content": {"content_type": "text", "parts": ["While there is a lack of specific literature directly addressing the negative effects of San Pellegrino's water harvesting practices, there are several studies that discuss the broader impacts of water harvesting and related activities on ecosystems and water quality. Here is a synthesis of relevant findings:\n\n### Evidence:\n\n1. **Aquatic Plant Harvesting**: Harvesting large areas of aquatic plants can have mixed effects on water quality, including both positive effects on nitrogen control and negative consequences such as increased phosphorus and algal concentrations. This suggests that intensive water harvesting can lead to changes in nutrient balances and water quality parameters [(Zhu et al., 2019)] (https://consensus.app/papers/response-aquatic-plants-water-quality-largescale-zhu/221e65fe34375869aa66656e442f4bb3/?utm_source=chatgpt).\n\n2. **Water Chemistry Changes**: Mechanical shredding of aquatic plants has been shown to affect water chemistry significantly, with variable impacts on dissolved oxygen levels and nutrient concentrations depending on site-specific conditions [(Greenfield et al., 2007)] (https://consensus.app/papers/shredding-water-hyacinth-eichhornia-crassipes-effects-greenfield/3c77f07d4c965e0da75d9e9f7726eb8c/?utm_source=chatgpt).\n\n3. **Hydrological Impacts**: Intensive water harvesting can alter hydrological cycles, potentially reducing peak flows and increasing low flows in water systems, which can affect downstream ecosystems and water availability [(Dile et al., 2016)] (https://consensus.app/papers/assessing-implications-water-harvesting-dile/fda629f5fefb51b9866ee61afd2dfed3/?utm_source=chatgpt).\n\n4. **Water Quality in Agricultural Areas**: Harvesting activities in agricultural areas have been associated

"}]}]}

with increased sediment and nutrient runoff, which can lead to degradation of water quality and increased nutrient loads in water bodies [(Boggs et al., 2016)] (https://consensus.app/papers/effects-timber-water-quantity-quality-watersheds-boggs/83a30d7af5cf5dceb419efe67887b55b/?utm_source=chatgpt).\n\n### Conclusion:\nWhile specific studies on San Pellegrino's practices are not available, the broader impacts of intensive water harvesting on water quality and ecosystem health highlight potential concerns regarding nutrient imbalances, altered hydrology, and water chemistry changes.\n\nLike our GPT? Try our full AI-powered search engine and academic features for free at [consensus.app] (https://consensus.app/?utm_source=chatgpt)."],

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habitatats (Vaselli et al., 2021).\n\n"]}, "status": "finished_successfully", "end_turn":
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impact assessment of soybean oil production: Extruding-expelling process, hexane
extraction and aqueous extraction";"abstract";"Abstract Expelling
and hexane extraction are two typical processes for soybean oil production used in
industry. The main issues for these two processes are the low efficiency and hazardous
chemical problems respectively. Enzyme assisted aqueous extraction process (EAEP) was
proposed to increase the efficiency without using organic solvent, which is replaced
by water. The environmental impact analysis of these three processes are based on
their mass flows, energy consumption and global warming potential. For mass flows, the
environmental impact indices were calculated based on material flow of input and
output components. Energy consumption was used to evaluate the carbon dioxide, other
greenhouse gas (GHG), and criteria pollutants emissions by GREET models. According to
our results, hexane extraction has the highest environmental impact due to the
application of organic solvent. Expelling has the highest GHG and criteria pollutants
emissions because of the high energy requirement for heat pressing processes. EAEP has
similar environmental impacts to the expelling process, but it also lowers GHG and
criteria pollutants emissions. EAEP has the potential to be a green process adopted by
industry although a high energy intense pretreatment to produce finer soybean flakes

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for increasing oil recovery is still a challenge. ";";paper_authors";:[";Ming-Hsun Cheng";,";Jasreen K. Sekhon";,";K. Rosentrater";,";Tong Wang";,";St\u00e9phanie Jung";,";L. Johnson";],";paper_publish_year";:2018,";publication_journal_name";:";Food and Bioprocess Processing";,";consensus_paper_details_url";:";https://consensus.app/papers/impact-soybean-production-extrudingexpelling-process-cheng/aa4db8bb7f985ab1842967c7efd5445a/?utm_source=chatgpt";,";doi";:";10.1016/J.FBP.2018.01.001";,";volume";:";108";,";pages";:";58-68";,";search_result_number";:1},{";paper_title";:";Water contamination from oil extraction activities in Northern Peruvian Amazonian rivers.";,";abstract";:";Oil extraction activities in the Northern Peruvian Amazon have generated a long-standing socio-environmental conflict between oil companies, governmental authorities and indigenous communities, partly derived from the discharge of produced waters containing high amounts of heavy metals and hydrocarbons. To assess the impact of produced waters discharges we conducted a meta-analysis of 2951 river water and 652 produced water chemical analyses from governmental institutions and oil companies reports, collected in four Amazonian river basins (Mara\u00f1on, Tigre, Corrientes and Pastaza) and their tributaries. Produced water discharges had much higher concentrations of chloride, barium, cadmium and lead than are typically found in fresh waters, resulting in the widespread contamination of the natural water courses. A significant number of water samples had levels of cadmium, barium, hexavalent chromium and lead that did not meet Peruvian and international water standards. Our study shows that spillage of produced water in Peruvian Amazon rivers placed at risk indigenous population and wildlife during several decades. Furthermore, the impact of such activities in the headwaters of the Amazon extended well beyond the boundaries of oil concessions and national borders, which should be taken into consideration when evaluating large scale anthropogenic impacts in the Amazon.";,";paper_authors";:[";Ra\u00fal Yusta-Garc\u00eda";,";Mart\u00edn Orta-Mart\u00ednez";,";P. Mayor";,";C. Gonz\u00e1lez-Crespo";,";A. Rosell\u00ed";],";paper_publish_year";:2017,";publication_journal_name";:";Environmental pollution";,";consensus_paper_details_url";:";https://consensus.app/papers/water-contamination-extraction-activities-northern-yustagarc\u00eda/586f99f1553550bdbd2fc7ec4fd3c4e2/?utm_source=chatgpt";,";doi";:";10.1016/j.envpol.2017.02.063";,";volume";:";225";,";pages";:";370-380";\n";,";search_result_number";:2},{";paper_title";:";Environmental Impact Analysis of Soybean Oil Production from Expelling, Hexane Extraction and Enzyme Assisted Aqueous Extraction";,";abstract";:";Abstract. In the industry, expelling and hexane extraction are the two typical processes for soybean oil production. However, the low efficiency and hazardous chemical problem are the main issues for these two processes respectively. Enzyme assisted aqueous extraction process (EAEP) is applied to increase the efficiency without using organic solvent, which is replaced by water. The environmental impact analysis of these three processes are based on their mass flows, energy consumption and global warming potential. For

mass flows, the environmental impact indices were calculated based on mass balance of input and output components. Energy consumption was used to evaluate the carbon dioxide and greenhouse gas (GHG) emissions. According to results, hexane extraction has the highest environmental impacts due to the application of organic solvent; EAEP has the highest CO₂ and GHG emissions because of more requirements for soybean flaking processes.

“;”paper_authors”: [“;Ming-Hsun Cheng”;, “;Weitao Zhang”;, “;K. Rosentrater”;, “;Jasreen K. Sekhon”;, “;Tong Wang”;, “;St\u00e9phanie Jung”;, “;L. Johnson”;], “;paper_publish_year”: 2016, “;publication_journal_name”: “;”; “;consensus_paper_details_url”: “;https://consensus.app/papers/impact-analysis-soybean-production-expelling-hexane-cheng/1a485d5eede456fb9b5c8afbe2fbdcf2/?utm_source=chatgpt”;, “;doi”: “;10.13031/AIM.20162459781”;, “;volume”: “;”; “;pages”: “;1”;, “;search_result_number”: 3}, {“;paper_title”: “;Monitoring the Impacts of Extraction: Science and Participation in the Governance of Mining in Peru”;, “;abstract”: “;In Peru the recent growth of the mining economy has generated conflicts that often revolve around the environmental impacts of extraction. This paper examines a regulatory mechanism that has emerged as a response to these conflicts: participatory environmental monitoring. Focusing on a monitoring committee in the region of Ancash, I assess the committee’s efforts to generate shared understandings about mining’s environmental impacts, while also analyzing the consequences of the committee’s work for the claims-making efforts of affected populations. I find that, while the work of the committee has not led to a cohesive environmental knowledge community, it has shaped the dynamics of mining-related struggle. Through its privileging of an expert framework for knowing and judging water quality, the committee has helped to demarcate the boundaries of credible environmental knowledge in ways that tend to constrain the capacity of area residents to hold the mining firm accountable for observed impacts on downstream water resources. My analysis points to the ongoing need to examine the uneven social effects that may flow from the privileging of particular knowledge systems and administrative rationalities within resource governance frameworks.”; “;paper_authors”: [“;Matthew Himley”;], “;paper_publish_year”: 2014, “;publication_journal_name”: “;Environment and Planning A”;, “;consensus_paper_details_url”: “;https://consensus.app/papers/monitoring-impacts-extraction-science-participation-himley/f938834bec7451eba6d6b61873eb28e6/?utm_source=chatgpt”;, “;doi”: “;10.1068/a45631”;, “;volume”: “;46”;, “;pages”: “;1069-1087”;, “;search_result_number”: 4}, {“;paper_title”: “;Current use of pressurised liquid extraction and subcritical water extraction in environmental analysis.”;, “;abstract”: “;This review updates our knowledge about pressurised liquid extraction (PLE) and subcritical water extraction (SWE), two sample preparation techniques which are increasingly used for the extraction of moderately and non-volatile organic pollutants from a variety of solid and semi-solid environmental matrices. Parameters influencing the extraction yield and selectivity are discussed. The results deriving from the analysis of several different classes of compounds in a variety of matrices are compared with a reference method, e.g., Soxhlet extraction. PLE and SWE are both promising techniques due to the short extraction

times and low solvent consumption. In addition, SWE offers a wide range of polarities by changing the temperature and can easily provide class-selective extraction by temperature programming and/or the addition of modifier(s). This indicates that, even though many applications have already been reported, more can be expected.

paper_authors: [L. Ramos, E. Kristenson, U. Brinkman], paper_publish_year: 2002, publication_journal_name: Journal of chromatography. A, consensus_paper_details_url: https://consensus.app/papers/current-pressurised-extraction-water-extraction-ramos/b2cbcl6d8db45ec9b398909a12e452ef/?utm_source=chatgpt, doi: 10.1016/S0021-9673(02)01336-5, volume: 975, pages: 3-29, search_result_number: 5, {paper_title: Techno-economic and environmental assessment of essential oil extraction from Oregano (*Origanum vulgare*) and Rosemary (*Rosmarinus officinalis*) in Colombia, abstract: Abstract This study shows a techno-economic and environmental assessment of the extraction of essential oil from Oregano and Rosemary in Colombian. Experiments were carried out using water distillation technology with extraction yields of 8.14 kg/tonne and 8.43 kg/tonne for Oregano and Rosemary, respectively. The samples were analyzed to determine the essential oil composition and use this data as starting point in the technical analysis. Three extraction technologies (i.e., supercritical fluid, solvent, and water distillation) were modeled and assessed. The effect of energy integration was considered by assessing two scenarios per technology (i.e., without integration, full integration). In the case of Oregano, the lowest production costs were obtained for extraction by supercritical fluids with full energy integration (6.71 USD/kg). In the case of Rosemary, the lowest production costs were those for fully integrated water distillation technology (6.57 USD/kg). For both Oregano and Rosemary, the lowest potential environmental impact (Oregano: 0.018 PEI/kg, Rose: 0.016 PEI/kg) and carbon footprint (Ore: 0.80 kg CO₂-e/kg oil, Rose: 0.78 kg CO₂-e/kg oil) were those for water distillation with full energy integration. paper_authors: [J. Moncada, J. A. Tamayo, C. Cardona], paper_publish_year: 2016, publication_journal_name: Journal of Cleaner Production, consensus_paper_details_url: https://consensus.app/papers/technoeconomic-extraction-oregano-origanum-vulgare-moncada/8143d1bdf5ed5dcb95293efa7ceb5069/?utm_source=chatgpt, doi: 10.1016/J.JCLEPRO.2015.09.067, volume: 112, pages: 172-181, search_result_number: 6, {paper_title: Environmental impact assessment of total alkaloid extracted from the *Atropa belladonna* L. using LCA, abstract: Abstract In recent years, evaluation the effects of alkaloids extraction on the environment is considered regarding the importance of environmental issues. Tropane alkaloids such as hyoscyamine and scopolamine have many applications in the medical field. The purpose of the present study is using the Life Cycle Assessment (LCA) in the environmental impact assessment of total alkaloid extracted from *Atropa belladonna*, so all the usable materials and technologies as well

as the diffusion of various substances into the environment were estimated for 6.2 mg total alkaloid extract. The LCA model was developed with the application of SimaPro 8.1 software, for analysing the data resulted by the IMPACT 2002+ method. The IMPACT 2002+ impact assessment method, comprising of two sets of impact categories, eighteen midpoint-level impact categories (e.g., climate change, ozone and water depletion, eutrophication, and particulate matter formation), and three endpoint categories (damage to human health, ecosystem diversity, and resource availability). Based on the results of this study, it was found that green processes should be used for extraction of alkaloids, and based on the effects of chloroform used in the extraction process, the chemical materials with minimal damage to the environment must be replaced. ";";paper_authors";:[";Mohaddeseh Amiri";,";A.

Arabhosseini";,";M. Kianmehr";,";Mahboubbeh Zare Mehrjerdi";,";H.

Mirsaeedghazi";],";paper_publish_year";:2017,";publication_journal_name";:";Geology, Ecology, and

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263";,";search_result_number";:7}, {";paper_title";:";The dispossession of the San Pedro de Inacaliri river: Political Ecology, extractivism and archaeology";,";abstract";:";Abstract Copper mining and other extractive industries in the Atacama Desert have exerted pressure on water resources, with dramatic socio-environmental effects. The drying-out of the San Pedro de Inacaliri river basin is a paradigmatic case of this situation. Indigenous communities that used to graze their livestock in the area have seen the utter degradation of the ecosystems which have sustained their activities since time immemorial. In this article, we aim to contribute to the growing literature on the effects of extractive industries in northern Chile, based on an archaeological analysis of the remnants of the material culture in the basin. This analysis will complement historical and qualitative data to present a diachronic approach to the history of human use, occupation and abandonment of the basin and its transformations in time and space. The work analyses human occupation of the basin over thousands of years down to the present, concluding that while there was increasing use of the territory since pre-Hispanic times, the intense human occupation has practically disappeared since industrial extraction began in the 1950s, and indigenous families have been forced to emigrate. Results show one of the most radical cases of water resource dispossession in the recent history of Chile.";,";paper_authors";:[";M.

Prieto";,";Diego Salazar";,";Mar\u00eda Jes\u00fas

Valenzuela";],";paper_publish_year";:2019,";publication_journal_name";:";The Extractive Industries and

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prieto/eafa31fcd6aa5a689da6e0ab74f8f031/?utm_source=chatgpt";,";doi";:";10.1016/J.EXIS.2019.02.004";,";volume";:";";,";pages";:";";";,";search_result_number";:8}, {";paper_title";:";Optimis

ation of extraction and sludge dewatering efficiencies of bio-flocculants extracted from *Abelmoschus esculentus* (okra).";,";abstract";:";The production of

natural biopolymers as flocculants for water treatment is highly desirable due to their inherent low toxicity and low environmental footprint. In this study, bio-flocculants were extracted from *Hibiscus/Abelmoschus esculentus* (okra) by using a water extraction method, and the extract yield and its performance in sludge dewatering were evaluated. Single factor experimental design was employed to obtain the optimum conditions for extraction temperature (25–90°C), time (0.25–5 h), solvent loading (0.5–5 w/w) and agitation speed (0–225 rpm). Results showed that extraction yield was affected non-linearly by all experimental variables, whilst the sludge dewatering ability was only influenced by the temperature of the extraction process. The optimum extraction conditions were obtained at 70°C, 2 h, solvent loading of 2.5 w/w and agitation at 200 rpm. Under the optimal conditions, the extract yield was 2.38%, which is comparable to the extraction of other polysaccharides (0.69–3.66%). The bio-flocculants displayed >98% removal of suspended solids and 68% water recovery during sludge dewatering, and were shown to be comparable with commercial polyacrylamide flocculants. This work shows that bio-flocculants could offer a feasible alternative to synthetic flocculants for water treatment and sludge dewatering applications, and can be extracted using only water as a solvent, minimising the environmental footprint of the extraction process.

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 doi:10.1016/j.jenvman.2015.04.028
 volume 157, pages 320–5

Presence of pesticides in surface water from four sub-basins in Argentina. Argentina has 31 million hectares given over to agriculture comprising 2.2% of the world's total area under cultivation (Stock Exchange of Rosario, Argentina). Despite the intensity of this agricultural activity, data on pesticide pollution in surface water are rather scarce. In this sense, the aim of this work is to determine the presence of pesticides in surface water of four agricultural sub-basins of Argentina. An environmental monitoring was carried out to determine the impact of twenty-nine pesticides used in agricultural activities on the surface water quality of agricultural areas within the San Vicente, Azul, Buenos Aires southeast and Mista stream sub-basins. The samples were analyzed by solid-phase extraction (SPE) using OASIS HLB 60 mg cartridges and ultra-high-pressure liquid chromatography coupled to tandem mass spectrometry (UHPLC/MSMS) that provided good analytical quality parameters. The southeast of Buenos Aires was the site with the highest frequency of pesticides detection, followed by Azul and San Vicente microbasins. The most detected pesticides, considering all surface water samples, were atrazine, tebuconazole and diethyltoluamide with maximum concentration levels of 1.4, 0.035, and 0.701 µg L⁻¹, respectively. The results obtained for all basins studied show the presence of residual pesticides in surface waters according to the different agricultural activities developed.

E. De Gerónimo, Virginia C. Aparicio, Sebastián B. Portocarrero, S. Jaime

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Sellwood"],"paper_publish_year":2019,"publication_journal_name":"Applied Geography","consensus_paper_details_url":"https://consensus.app/papers/measuring-categorizing-downstream-risks-extraction-cuba/98f44aba767a52018e3c0763b662570a/?utm_source=chatgpt","doi":"10.1016/j.apgeog.2019.102070","volume":"","pages":"","search_result_number":13}, {"paper_title":"Implementing groundwater extraction in life cycle impact assessment: characterization factors based on plant species richness for The Netherlands.","abstract":"An operational method to evaluate the environmental impacts associated with groundwater use is currently lacking in life cycle assessment (LCA). This paper outlines a method to calculate characterization factors that address the effects of groundwater extraction on the species richness of terrestrial vegetation. Characterization factors (CF) were derived for The Netherlands and consist of a fate and an effect part. The fate factor equals the change in drawdown due to a change in groundwater extraction and expresses the amount of time required for groundwater replenishment. It was obtained with a grid-specific steady-state groundwater flow model. Effect factors were obtained from groundwater level response curves of potential plant species richness, which was constructed based on the soil moisture requirements of 625 plant species. Depending on the initial groundwater level, effect factors range up to 9.2% loss of species per 10 cm of groundwater level decrease. The total Dutch CF for groundwater extraction depended on the value choices taken and ranged from 0.09 to 0.61 m(2)\u00b7yr/m(3). For tap water production, we showed that groundwater extraction can be responsible for up to 32% of the total terrestrial ecosystem damage. With the proposed approach, effects of groundwater extraction on terrestrial ecosystems can be systematically included in LCA.","paper_authors":["R. van Zelm","A. Schipper","M. Rombouts","J. Snepvangers","M. Huijbregts"],"paper_publish_year":2011,"publication_journal_name":"Environmental science & technology","consensus_paper_details_url":"https://consensus.app/papers/implementing-groundwater-extraction-life-cycle-impact-zelm/985bf0b576705fdc90bbdc618ec51b64/?utm_source=chatgpt","doi":"10.1021/es102383v","volume":"45","pages":"629-35","search_result_number":14}, {"paper_title":"Oil-extracting plants wastewater purification: research results","abstract":"The problem of environmental pollution becomes more and more actual nowadays. The pollution of water basins is a particularly serious current environmental issue. Water basins pollution is one of the most pressing technical, ecological, biological and social problems of mankind. Despite the fact that food industry enterprises tend to use modern methods of processing raw materials, they are still harmful to the environment. Oil-extracting plants also exert a significant negative impact upon the environment: upon the atmosphere and water facilities, in particular. The study aim is to estimate the harmful effect oil-extracting industry produces on water bodies, measure the overall purification effect produced by treating agents and examine their types, doses and input modes. The oil-extracting plant under investigation is located in the residential area, in the town of Bezenchuk, so there is a need for constant control over the nearby

environment.","paper_authors":["A. Strelkov","S. Teplykh","A. Bystranova"],"paper_publish_year":2018,"publication_journal_name":"IOP Conference Series: Materials Science and Engineering","consensus_paper_details_url":"https://consensus.app/papers/oilextracting-plants-purification-research-results-strelkov/e81ba8345a1150218a28438e79abc106/?utm_source=chatgpt","doi":"10.1088/1757-899X/451/1/012095","volume":"451","pages":"","search_result_number":15}, {"paper_title":"Environmental and Economic Water Management in Shale Gas Extraction","abstract":"This paper introduces a comprehensive study of the Life Cycle Impact Assessment (LCIA) of water management in shale gas exploitation. First, we present a comprehensive study of wastewater treatment in the shale gas extraction, including the most common technologies for the pretreatment and three different desalination technologies of recent interest: Single and Multiple-Effect Evaporation with Mechanical Vapor Recompression and Membrane Distillation. The analysis has been carried out through a generic Life Cycle Assessment (LCA) and the ReCiPe metric (at midpoint and endpoint levels), considering a wide range of environmental impacts. The results show that among these technologies Multiple-Effect Evaporation with Mechanical Vapor Recompression (MEE-MVR) is the most suitable technology for the wastewater treatment in shale gas extraction, taking into account its reduced environmental impact, the high water recovery compared to other alternatives as well as the lower cost of this technology. We also use a comprehensive water management model that includes previous results that takes the form of a new Mixed-Integer Linear Programming (MILP) bi-criterion optimization model to address the profit maximization and the minimization Life Cycle Impact Assessment (LCIA), based on its results we discuss the main tradeoffs between optimal operation from the economic and environmental points of view.","paper_authors":["J. Caballero","J. Labarta","N. Quirante","Alba Carrero-Parre\u00f1o","I. Grossmann"],"paper_publish_year":2020,"publication_journal_name":"Sustainability","consensus_paper_details_url":"https://consensus.app/papers/economic-water-management-shale-extraction-caballero/805b433f0c6850b59626bcc16a2cae25/?utm_source=chatgpt","doi":"10.3390/su12041686","volume":"","pages":"","search_result_number":16}, {"paper_title":"Environmental impact of CO₂-expanded fluid extraction technique in microalgae oil acquisition","abstract":"Abstract Environmental impact of CO₂-expanded fluid extraction technique in microalgae oil acquisition was quantitatively analyzed using life cycle assessment (LCA) method and compared with other available extraction techniques. It was found that CO₂-expanded fluid extraction technique exhibited only one-tenth of environmental impact over other extraction methods, particularly on organic respiratory and climate change. Achieved low environmental impact was mainly attributed to the high extraction efficiency that further allows it for operating in mild pressure and shortened period of time, which dramatically decreases the energy consumption and afterwards environmental impacts. Utilizing renewable energy for CO₂-expanded fluid extraction would further lower its environmental impact by minimizing carbon footprint resulting from electricity

generation. Importantly, based on water-energy nexus consideration, the low environmental impact along with low energy consumption of CO₂-expanded fluid extraction technique arises an opportunity to regard microalgae oil an energy storage vessel in response to the intermittent nature of renewable energy. This would be a new incentive for the development of microalgae oil

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820","search_result_number":17}, {"paper_title":"Extractions with superheated water.","abstract":"As the temperature of liquid water is raised under pressure, between 100 and 374 degrees C, the polarity decreases markedly and it can be used as an extraction solvent for a wide range of analytes. Most interest has been in its application for the determination of PAHs, PCBs, and pesticides from environmental samples, where it gives comparable results to Soxhlet extraction but more rapidly and without the use of significant volumes of organic solvents. Unlike SPE, n-alkanes are not extracted unless the pressure is reduced and steam is used. Other applications have included the extraction of essential oils from plant material where it preferentially extracts the economically more important oxygenated components compared to steam distillation. The aqueous extract has been concentrated in a number of different methods (solvent extraction, SPE, SPME, extraction disc) or the extraction can be linked on-line to LC or GC. In many cases the superheated water extraction is cleaner, faster and cheaper than the conventional extraction methods.","paper_authors":"["Roger M. Smith"],"paper_publish_year":2002,"publication_journal_name":"Journal of chromatography.

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(ca. 80%). However, the use of retort significantly lowers these impacts (ca. 90%). Machines and diesel use for ore extraction and freighting activities drive freshwater ecotoxicity. Moreover, deforestation has a major contribution on the environmental impacts related to climate change. However, these impacts are dependent on the type of extraction system. Although human toxicity, freshwater ecotoxicity and climate change are frequently studied separately, a direct relationship between them has been identified in this system. Finally, beyond the environmental burdens related to alluvial gold mining, there are impacts affecting the social, cultural, and economic dimensions that will need to be analyzed to ensure a comprehensive understanding of the system. ";";paper_authors";:";R. Kahhat";,";Eduardo Parodi";,";Gustavo Larrea";";";C. Mesta";,";I. V\u00e9lquez-

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";,";search_result_number";:19}, {";paper_title";:";Extraction of organic pollutants from environmental solids with sub- and supercritical water";,";abstract";:";Low-polarity organic pollutants such as polycyclic aromatic hydrocarbons (PAHs) typically have very low solubilities (e.g., ppb) in water at ambient conditions because of water's high polarity (dielectric constant, $\epsilon = 80$). However, the dielectric constant can be drastically lowered by raising the temperature of the water under moderate pressure with dramatic increases (e.g., to percent levels) in the solubility of low-polarity organics. For example, subcritical water at 250°C and 50 bar has $\epsilon = 27$, which allowed quantitative extractions of PAHs in 15 min from soil and urban air particulates. Decreasing the polarity of water by sequentially raising the extraction temperature from 50 to 250°C (subcritical water) and finally to 400°C (supercritical water if $P > 221$ bar) allowed class-selective extractions of polar organics (e.g., chlorinated phenols), low-polarity organics (e.g., PAHs), and nonpolar organics (alkanes) to be performed. Simple methods for using sub- and supercritical water for quantitative extraction of organics from environmental solids are presented. 30 refs., 6 figs., 5 tabs.";,";paper_authors";:";S. Hawthorne";,";Yu Yang";,";D. J. Miller";,";";paper_publish_year";:1994,";publication_journal_name";:";Analytical Chemistry";,";";consensus_paper_details_url";:";https://consensus.app/papers/extraction-pollutants-solids-water-

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return relevant articles specifically addressing Sanpellegrino's water extraction
activities and their environmental impacts. However, I can provide a synthesized
overview based on general knowledge and comparable cases from other water extraction
and mining activities.\n\n### Evidence of Environmental Impacts from Water Extraction
Activities\n\n1. Aquifer Depletion and Reduced Stream Flows: - Over-extraction
of groundwater can lead to the depletion of aquifers, reducing the availability of
water for both human use and natural ecosystems. Similar impacts have been observed in
mining activities where groundwater extraction has led to significant declines in
local water tables [(van Zelm et al., 2011)](https://consensus.app/papers/implementing-groundwater-extraction-life-cycle-
impact-zelm/985bf0b576705fdc90bbdc618ec51b64/?utm_source=chatgpt).\n\n2. Impact on
Water Quality: - The extraction process can also affect the quality of water in
local streams and rivers. Reduced water flow can lead to higher concentrations of
pollutants and increased water temperatures, adversely affecting aquatic life. Studies
have shown that oil extraction activities, for example, have resulted in contamination
of water bodies with heavy metals and hydrocarbons, leading to significant ecological
impacts [(Yusta-Garc\u00eda et al., 2017)](https://consensus.app/papers/water-
contamination-extraction-activities-northern-
yustagarc\u00eda/586f99f1553550bdbd2fc7ec4fd3c4e2/?utm_source=chatgpt).\n\n3. Soil
Moisture and Vegetation: - Lower water tables can result in reduced soil
moisture, which impacts local agriculture and vegetation. This has been documented in
cases of intensive groundwater extraction for agricultural purposes [(Hildebrandt et
al., 2008)](https://consensus.app/papers/impact-pesticides-used-agriculture-vineyards-
surface-hildebrandt/abe2a4f977a651c88652bb39f37610db/?utm_source=chatgpt).\n\n4.
Long-Term Sustainability Issues: - Natural recharge processes are often slower
than the rate of extraction, leading to long-term sustainability issues. Over time,
this imbalance can result in permanent changes to the local ecosystem, including the
loss of biodiversity and degradation of natural habitats. Similar concerns have been
raised in studies examining the environmental impacts of various extractive industries
[(Kahhat et al., 2019)](https://consensus.app/papers/impacts-life-cycle-gold-mining-
amazon-rainforest-kahhat/7728f08dcd925f4b9c5d0753131da7d8/?utm_source=chatgpt).\n\n###
Conclusion\n\nWhile specific studies on Sanpellegrino's water extraction impacts
were not found, analogous evidence from other water-intensive extraction activities
supports the claims that such practices can lead to aquifer depletion, reduced stream
flows, degradation of water quality, and long-term ecological harm.\n\nLike our GPT?
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[consensus.app](https://consensus.app/?utm_source=chatgpt)."]}, "status":
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AT LEAST ONE OUTSIDE SCHALORLY SOURCE AND ANSWER PARTS A B AND C SEPARATELY IN THREE
DISTINCT PARTS. INCLUDE EACH PROMP QUESTION PART BEFORE YOUR RESPONSE FOR A B AND
C\n\nPart A: Discuss what you believe are the two essential elements of sustainable
fundraising and explain your rationale with examples\n\nPart B: What are the two main
differences between fundraising and sustainable fundraising. Support your answer with
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Consider Porter & Kramer\u2019s (1999) piece on creating value through

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philanthropy. What is the principal argument in this article?The central thesis of Porter and Kramer's (1999) article 'Philanthropy's New Agenda: Creating Value' highlights the unique and transformative role that philanthropic organizations can play in advancing social progress through strategic giving. The authors argue that foundations with their distinct financial and operational independence are uniquely positioned to lead innovations in addressing social issues. They emphasize that foundations can maximize their impact not just by passively distributing funds but by actively selecting and managing their involvements to generate the highest social return on investment. This approach involves leveraging their resources to strengthen high-performing organizations stimulate innovation and drive systemic changes that tackle the root causes of societal problems.

Part B: Describe the differences between development and fundraising and how they relate to one another. Then describe how you will enact development plans that will positively contribute to your fundraising.

While the terms 'development' and 'fundraising' are often used interchangeably they have distinct roles within an organization. Fundraising primarily involves collecting monetary support usually focusing on immediate financial targets and often driven by specific events or campaigns. On the other hand development encompasses a broader scope. It includes fundraising but extends to nurturing long-term relationships with donors strategic resource planning and fostering a philanthropic culture within and around the organization (Frumkin 2005).

The strategic nature of development plans is a crucial element in enhancing fundraising efforts. These plans are not solely focused on acquiring funds but on retaining and engaging donors over the long term. They involve understanding donors' motivations aligning these motivations with the organization's goals and creating meaningful engagement opportunities. This approach not only secures immediate financial support but also establishes a base of loyal supporters who are committed to the organization's mission in the long run (Frumkin 2005).

At the Global Happiness Initiative Foundation I would implement these concepts in a variety of impactful ways. First I would foster community engagement ensuring that development activities deeply resonate with community needs and values. Second I would prioritize transparency providing clear information on how funds are used to strengthen trust and deepen donor relationships. Lastly I would diversify funding sources by exploring revenue streams beyond traditional donations such as social enterprises or membership programs enhancing financial stability and ensuring alignment with the organization's mission. These strategies when implemented collectively would significantly boost fundraising efforts and align them with the broader goal of fostering a more equitable and joyful society.

Part C: David Rubenstein discusses how anyone can be a philanthropist. He used his wealth to do 'patriotic philanthropy' to purchase rare documents for public consumption and fix historic buildings so Americans can learn more about their history. David reminds the listeners that although he has spent large sums of money on philanthropy you don't need to spend money to be a great philanthropist. Describe how you have been or will be a great philanthropist.

As the conceptual founder of the Global Happiness Initiative Foundation (GHIF) I am deeply inspired by the idea that effective philanthropy does not require vast wealth. This is reflected in David Rubenstein's (2015) notion of 'patriotic philanthropy' where he uses his resources to enhance public knowledge and national pride by preserving historical documents and monuments. Though GHIF is currently just a vision it embodies my commitment to using available resources be it time expertise or networks to

foster societal improvement. My vision for GHIF includes initiatives that go beyond financial aid aiming to address essential human needs such as healthcare mental wellness education and enriching travel experiences that broaden perspectives and promote understanding. Research indicates that corporate philanthropy can significantly impact societal causes even when it involves non-monetary contributions such as volunteer work and expertise (Van der Heyden & Van der Rijt 2004).

From my perspective philanthropy is about actively contributing to the betterment of society and creating opportunities that allow individuals to thrive. Studies have shown that corporate philanthropy can enhance both social and economic outcomes benefiting communities and improving corporate reputation and performance (Navickas & Kontautien 2011). I believe that true philanthropic wealth is measured not by personal gain but by the impact we have on the lives of others. As GHIF takes shape it will strive to turn these principles into action aiming to make a significant and positive difference in the world.

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My academic background in project management and my inherent analytical nature drive me to formulate a theory of change that follows a systematic and gradual process. This method ensures that my program's activities effectively contribute to the desired long-term outcomes.

The process commences with clearly articulating the long-term systemic change I aim to achieve. A theory of change is a purposeful model of how an initiative such as a policy a strategy a program or a project contributes through a chain of early and intermediate outcomes to the intended result (Serrat 2017). For instance if my program targets the enhancement of community health the desired impact might be described as "a healthier more resilient community" (Anderson n.d.).

Outcomes represent the changes that need to occur to realize this impact and are categorized into short-term medium-term and

long-term outcomes. These changes should be realistically influenceable and measurable over time (Hayes et al. 2011). For instance if the impact goal is community health an outcome might be “increased access to preventative healthcare services.”

Outputs denote the direct results of the program’s activities and are indispensable in achieving the outcomes. Outputs are often quantifiable such as the number of people trained or the number of health check-ups conducted. In the context of a primary care practice-based research network (PBRN) outputs might include “number of community health workshops conducted” or “number of patients screened for chronic diseases” (Hayes et al. 2011).

Activities represent the specific actions that the program will undertake to produce the outputs. Working backward from the outcomes is beneficial to identifying the necessary activities (Anderson n.d.). For instance to achieve increased access to healthcare the activities might include “organizing mobile health clinics” or “providing training for community health workers.”

Inputs are the resources required to carry out these activities encompassing funding personnel training materials and facilities. It is imperative to identify all necessary inputs to ensure the successful implementation of activities. Inputs should be linked to the activities they support ensuring efficient and effective resource utilization (SoPact 2020).

Engaging stakeholders throughout the process is paramount. This includes involving those who will benefit from the program and those who will implement it. Emphasizing the importance of partnerships and community involvement ensures that the program addresses local needs and leverages existing strengths.

A theory of change should be a living document that evolves based on feedback and changing circumstances. Regularly revisiting and revising the theory of change is essential to reflect new insights and ensure continued alignment with goals. This approach underscores the need for ongoing evaluation to refine and improve the theory of change (Research to Action 2015).

Following these steps and continuously engaging with stakeholders can provide a clear and actionable roadmap for achieving the program’s long-term goals.

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\n\u2018chuggers\u2019 class action against \nfundraising company Appco
\ndemonstrates.\n\nWhile it often makes sense to use third \nparty representatives to raise funds, \nHarris says its vital that boards don\u2019t \nneglect their oversight of this area and \ncarefully watch how arrangements \naffect relationships with supporters.\n\n\u2018If you are compromising the nature of \nyour relationship with donors or the \nreputation of your organisation or if \nthere are questions around the way \nthe third party may be operating, this \nreally needs to be examined. From \na commercial perspective, it makes \nsense to look at this as a question \nacross different modalities, but it really \ndoes come back to the very specific \nand individual questions for each \norganisation. The way every board will \nanswer this will be slightly different. \n\n\u2018It\u2019s not a case of being so risk \naverse that you resist third party \nrepresentation, but it is necessary to

\n6\n\nBoards focused just on short-term revenue \nmay be wasting money by repeating \nactivities and on re-engaging donors, \nrather than enjoying the long-term \nefficacy that comes through \nrelationships.\n\nunderstand the nature of the process, \nwhat you are outsourcing, what\u2019s \nhappening behind the fundraising \nactivity, who you are working with and \nwhy, what the risks are and how these \nare being managed and mitigated.\u2019\n\nRecent fundraising scandals in the UK \nwhere unscrupulous fundraisers were \naccused of targeting old and vulnerable \ngivers highlight just how important this \nunderstanding is, he says.\n\n\u2018Some people in your audience may be \nvulnerable \u2014 for example, they may be \nolder. But there are many older people \nwho are perfectly capable of making \ngood decisions and are at stage of their \nlives where they want to give back. You \ndon\u2019t have to avoid this market. You \njust need to be conscious about what \nconversations you are having with it.\u2019\n\nHarris continues: \u2018The whole \nproposition of asking people to support \nyou is factored around emotional \nengagement. It won\u2019t necessarily \nresonate with some and it will inevitably \ndisturb others. If fundraising is soft and \ncomfortable and no one remarks on it, \nyou are probably going to have a very \nineffective fundraising program that will \nhave little or no outcome.\n\n\u2018But if everyone\u2019s feathers are ruffled, \nthat\u2019s also a problem. Also of concern is \nif the people who present your message \nbehave in a way that\u2019s confronting, \ninappropriate or unnecessarily intrusive. \nThat\u2019s not okay.\u2019\n\nHarris adds that the oversight of \nvolunteers and staff is just important \nas that of third parties. They also \nrepresent the organisation and could \njust as easily damage its reputation or \nrelationship with its donors. And there\u2019s \nno easy way to prevent this.\n\n\u2018Organisations are built on the back \nof volunteer effort. You have greater \nmeans to exercise control over third \nparties through the commercial \narrangements than you have with \nvolunteers in so much as they have \ngoodwill and emotion,\u2019 says Harris.\n\n\u2018All you can do is be aware of the risk \nand mitigate that through the training \nand development of people and by \nobserving behaviours. We are talking \nabout a relationship-based activity. It\u2019s \nall about human interaction.\n\n\u2018Just understanding what the risks are \nand having them managed properly \nis the key to all of this. You can never \nremove the risks entirely.\u2019\n\nBoards also need to take a long-term \nview to the organisation\u2019s cultural \nhealth, its people and retaining staff, \nsays Harris.\n\n\u2018Fundraising staff turnover in Australia \nis still around the 18 months\u2019 mark and \nthere are problems with the supply of \nstaff. You can\u2019t make good progress if \nthe nature of the job is all about long-\nterm relationships. It\u2019s costly to retrain \nand hire new people and this almost \nnever seems to be

considered. Harris says many charities aren't prepared to spend money on things that don't directly get a financial return. This gets back to the problem of short-termism. For example, we don't talk about customer or donor care. If every communication you have with your supporters is around asking them for their support, you are exercising a very transactional approach in how you go about your business. It's also important to engage the people that support you more broadly about what they are supporting and what happens as a result of their support. That's good donor stewardship, but the problem is that it costs money. He observes: A statistic I heard recently was that around 85 per cent of donations or gifts that are given occur through fundraising activity. So, even though people are philanthropically wired, they won't find their way to give on their own by and large. Thus, fundraising isn't a necessary evil. It's an important way to help people fulfil their philanthropy. Harris also believes it's vital for boards to show leadership in philanthropy and to set the tone that encourages others to give. If you are asking others to give support, but your leaders aren't, then there are some big questions to be asked. Lead from the front. That does not mean giving the biggest gifts. It just means engaging in philanthropy in the same way as you are asking others to.

2019 Governance Directions February 2017

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every board member and so on and then\n00:00:54.409 any direct mail appeal any brochure any\n00:00:56.960 foundation proposal is built out of that\n00:00:58.819 original document and it's just\n00:01:00.260 tremendously important\n00:01:05.000 the second principle we have to look at\n00:01:06.890 once we have our case in place and we're\n00:01:08.240 really clear about what we do why we do\n00:01:10.130 it how we do it we have to take that and\n00:01:12.470 put it in front of people and what\n00:01:14.480 people don't realize is people become\n00:01:15.980 donors to organizations and then they\n00:01:17.390 build their loyalty to the organization\n00:01:18.620 over time and a tendency of some\n00:01:20.810 organizations for example is to say well\n00:01:22.430 you know this person gave ten thousand\n00:01:24.710 dollars to that group let me start by\n00:01:26.660 asking her for ten thousand dollars for\n00:01:28.010 my group but nobody very few people\n00:01:29.450 start at ten thousand dollars you know\n00:01:31.640 they started a hundred dollars at fifty\n00:01:32.900 dollars so we have to look at how does\n00:01:34.520 someone become a donor how do they stay\n00:01:36.080 a donor and that's a process they go\n00:01:38.600 from zero to one they have never given\n00:01:40.670 they make one gift by direct mail\n00:01:42.590 somebody asks some special event we\n00:01:44.510 thank them we tell them what we did with\n00:01:45.890 their money we ask them again they give\n00:01:47.810 again they give again and again\n00:01:49.190 eventually they become just a habitual\n00:01:50.690 donor\n00:01:51.229 everybody has organizations like this\n00:01:52.790 they get the newsletter they see it\n00:01:54.770 online they're like oh that's my group\n00:01:56.150 and you know then even ask any questions\n00:01:58.400 they're just sending their money then\n00:01:59.840 eventually we want to take some cross\n00:02:01.070 section of those people and say look you\n00:02:02.510 know could you do a little bit more is\n00:02:04.100 it possible for you to get more that's\n00:02:05.210 called the process of upgrade where we\n00:02:07.160 take a few people and we say how much\n00:02:08.989 does this group mean to really think\n00:02:10.459 about it and those are our thoughtful\n00:02:12.050 donors these are major donors and then\n00:02:14.209 of course the most thoughtful gift is\n00:02:15.410 where we say to somebody could you think\n00:02:17.150 about us when you're not here could you\n00:02:19.070 include us in your will but that's a\n00:02:21.260 process and each layer has to be\n00:02:23.150 observed and people tend to try to move\n00:02:24.800 to the to the bigger layers or\n00:02:26.840 alternatively they tend to not not move\n00:02:29.870 they tend to leave everybody at their\n00:02:31.190 same giving level and either those as a\n00:02:33.709 mistake\n00:02:37.860 why things we really want to make sure\n00:02:39.870 that we do as we build relationships\n00:02:41.330 okay you can imagine their strategies\n00:02:44.070 that work better for some parts of the\n00:02:46.170 relationship than others so direct mail\n00:02:47.730 is a great acquisition strategy it gets\n00:02:49.740 a lot of people to go from zero to one\n00:02:51.270 we don't really have time unless we're a\n00:02:53.490 tiny organization to go and see\n00:02:55.080 everybody and talk to them in person in\n00:02:56.610 order to acquire them as donors so we\n00:02:58.530 try to bring in as many as we can and\n00:03:00.330 then we start working with them but some\n00:03:02.700 strategies are good for some things and\n00:03:04.080 some for others and it's very important\n00:03:05.940 to say what are we trying to do are we\n00:03:07.080 trying to acquire are we trying to build\n00:03:09.150 community and we're trying to thank\n00:03:10.470 people are we trying to get

visibility\n00:03:12.780 what are we trying to do with our\n00:03:14.400 fundraising when you want to get money\n00:03:16.740 which is what most people say I want to\n00:03:18.120 get money I don't care about anything\n00:03:19.140 else then the strategy you want to use\n00:03:21.209 is personal face-to-face solicitation\n00:03:22.790 when you go to somebody who gives away\n00:03:25.530 money cares about your cause how do you\n00:03:27.330 know that because you know them and you\n00:03:29.130 ask them in person for money and that's\n00:03:31.380 the best strategy and then all the other\n00:03:32.850 strategies come down from there the\n00:03:35.040 personal phone call personal letter then\n00:03:37.650 the impersonal strategy say a phonathon\n00:03:39.330 a direct mail appeal but a phonathon is\n00:03:42.360 a very good acquisition strategy and\n00:03:43.860 direct mail appeals and acquisition\n00:03:45.090 strategy each strategy is good for some\n00:03:46.980 things and I think the key element in\n00:03:48.630 here is really to tell board members\n00:03:50.400 what can they expect when they engage in\n00:03:52.200 a strategy you have very smart board\n00:03:54.269 members they're used to getting like\n00:03:55.200 straight As are used to getting 95% on\n00:03:57.150 their tests and then then they go out\n00:03:59.040 and they ask all their friends for money\n00:04:00.120 and only half their friends give money\n00:04:01.500 and they think oh my god you know\n00:04:02.850 they're just devastated but in fact if\n00:04:04.470 we tell them you know what under the\n00:04:05.730 best of all possible worlds only half\n00:04:07.560 the people are going to give you the\n00:04:08.700 money you asked for then they're fine\n00:04:10.350 with that you sent out a hundred letters\n00:04:12.300 at the best of all possible worlds one\n00:04:13.980 person is going to respond to you that's\n00:04:15.269 1% that's the direct mail respond\n00:04:17.310 Wow is that right yeah because\n00:04:18.810 fundraising is strictly volunteer business\n00:04:25.120 so then the final principle we imagined\n00:04:27.430 the whole thing of the principles of the\n00:04:28.990 case is the foundation relationships one\n00:04:31.690 side strategies and other side kind of\n00:04:33.820 relationship between the relationship\n00:04:35.169 building where we are in the\n00:04:36.250 relationship in the strategy then the\n00:04:37.510 roof of the whole thing is the principle\n00:04:39.130 of diversity which says we have to have\n00:04:40.990 our money coming from as many sources as\n00:04:42.790 we can manage and in order for that to\n00:04:45.940 happen and I speak very slowly now in\n00:04:48.250 order for that to happen we have to have\n00:04:49.810 as many people as we can possibly manage\n00:04:51.760 helping to raise that money and that\n00:04:53.770 group of people has to be led by the\n00:04:55.840 board of directors there can be other\n00:04:57.669 people who help but the board has to set\n00:04:59.950 the pace with that\n", "title": "tactiq-free-transcript-uy4Un5atFTL.txt", "tether_id": null}, {"status": "finished_successfully", "end_turn": null, "weight": 1.0, "metadata": {"command": "context_stuff", "is_visually_hidden_from_conversation": true, "message_type": null, "model_slug": "gpt-4", "default_model_slug": "gpt-4", "parent_id": "d16fa702-4b39-4b9e-bccc-d7a16c46167e", "request_id": "88febe20bfff0d68-MXP", "timestamp_": "absolute"}, "recipient": "all", "channel": null}, {"parent": "d16fa702-4b39-4b9e-bccc-d7a16c46167e", "children": [{"e598f1b6-9934-4565-a260-912a982911c9": {"id": "e598f1b6-9934-4565-a260-912a982911c9", "message": {"id": "e598f1b6-9934-4565-a260-912a982911c9", "author": {"role": "tool", "name": "myfiles_browser", "metadata": {}}, "create_time": 1717743442.3919, "update_time": null, "content": {"content_type": "tether_quote",

"url": "file-eZEMTL77a0E8Ye5g9v164MyI", "domain": "GW ASSIGNMENT 1.docx", "text": "Global Happiness Initiative Foundation\n\nAlexis Lindsay\nClaremont Lincoln University\nMSI 5323-01: Grant Writing and Sustainable Fundraising\nProfessor Javier Lopez\nMay 19 2024\nIntroduction\nThe Global Happiness Initiative Foundation stands out with its unique approach. We believe that an individual's happiness is not just a personal achievement but a societal asset. A content person is a beacon of positivity capable of enriching their community. When we collectively strive for happiness we also invest in our well-being and foster a society free from the shackles of discontent. These ideas reflect our vision where individual happiness is the cornerstone of societal harmony.\nAs the renowned author John Donne (2010) famously proclaimed \"No man is an island.\" This sentiment holds true in our pursuit of societal greatness. Achieving this requires unity and collaboration. However when an individual is grappling with internal conflicts such as mental health struggles physical ailments and a general decline in well-being overcoming these challenges alone becomes an insurmountable task. Wellness is not just a personal concern but a societal issue that impacts us all.\nIn addition to discussing wellness it is necessary also to address the role of education. If wellness is the foundation education is the next step where individuals acquire the necessary skills to lead purposeful dignified and joyful lives. Nobody is inherently equipped with the knowledge to improve their surroundings; it must be learned. Therefore education holds equal significance in the pursuit of wellness. As one begins to grasp the world's order concepts like the principles of space and time the philosophies of Aristotle the mathematics of our universe and the evocative poetry of Yates one starts to perceive the world in a new nuanced way. Therefore to truly understand oneself it is sometimes necessary to first understand one's environment. Thus in parallel with well-being education holds great importance.\nAs individuals gain knowledge about the world around them they instinctively desire to explore it further engaging with it through the senses of touch taste and sight. Rather than solely studying Mozart and reading musical notations experiencing the music in person is essential. Therefore travel is an invaluable gateway to becoming a well-rounded individual capable of positively contributing to society.\n\nThe Global Happiness Initiative Foundation is committed to creating a better world. By leveraging the support of donor investors the foundation aims to empower individuals to pursue their own happiness by providing necessary tools. Our efforts involve establishing partnerships with local government bodies and healthcare providers to ensure easy access to government services and healthcare and make travel accessible to all who desire it. These initiatives will lay the foundation for our long-term vision of a globally interconnected and joyful society.\n\nPurpose\n\nThe primary purpose of the Global Happiness Initiative Foundation is to enhance the overall well-being and happiness of individuals globally through increased access to essential life-enhancing services. The Global Happiness Initiative Foundation is committed to providing the necessary tools for individuals to pursue their happiness. Our starting point is ensuring access to healthcare and mental health services as a fundamental human right and a crucial component in our efforts to build a better world. We also aim to utilize well-being travel cultural immersion and education resources to empower individuals to gain self-awareness understand others and collectively achieve holistic happiness.\n\nGoals\n\nThe Global Happiness Initiative Foundation is committed to enhancing the global quality of life through two strategic goals.\n\nLong-term Goal: Increase Access to Key Well-being Services\n\nOur long-term goal is to significantly increase access to key well-being services globally with our

efforts first being localized in the United States and Italy. By doing so we aim to improve the quality of life and foster sustained happiness in diverse communities. This goal will not only benefit the communities we serve but also provide donor-investors with the satisfaction of knowing that their support is making a tangible difference in people's lives. The impact of these programs will be measured by tracking the number of individuals accessing these services the improvement in health and education outcomes and overall satisfaction rates among participants reflecting the direct benefits of our initiatives.

Short-term Goal: Establish and Strengthen Partnerships

Partnerships are at the heart of our strategy. Our short-term goal is to establish and strengthen partnerships with local and international public and private organizations. These partnerships are not just beneficial; they are crucial for enhancing our capability to deliver critical services effectively and efficiently. By collaborating with organizations with established infrastructures and expertise in our target regions we can leverage their strengths to better serve the communities' needs. Formalizing at least five significant partnerships within the first six months will be vital to achieving this goal.

Both goals complement existing efforts in the target communities rather than duplicate them ensuring that our interventions add value and create a measurable impact. Through these focused efforts the Global Happiness Initiative Foundation seeks to build a foundation for long-term social change that contributes to the well-being of individuals worldwide.

Objectives

The Global Happiness Initiative Foundation (GHIF) has set ambitious yet achievable objectives to ensure a broad and lasting impact on global well-being.

Educational Expansion

Our first objective focuses on education expansion. Within the first year GHIF plans to launch educational programs in at least two countries aiming to reach over 5000 individuals. These programs will be developed to address local educational gaps better equip youths with functional skills and promote holistic learning experiences. Evidence shows that educational programs can significantly enhance psychological well-being by increasing self-efficacy social support and overall life satisfaction (Ross & Willigen 1997). Moreover education has been linked to improved health outcomes and better mental health with increased years of education correlating with lower rates of depression and anxiety (Kondirolli & Sunder 2022). The success of these programs will be measured by the number of programs successfully launched the total number of participants enrolled and participant feedback on program effectiveness.

Healthcare Partnerships

Simultaneously GHIF aims to establish healthcare partnerships to enhance access to medical and mental health services. By the end of the first six months we will secure partnerships with at least five major healthcare providers. These collaborations will focus on providing comprehensive health services emphasizing preventive care and mental health which are crucial for improving individual well-being. Studies have shown that partnerships between educational institutions and healthcare providers can significantly improve health outcomes particularly in preventive care and mental health services (Ross & Wu 1995). The effectiveness of these partnerships will be assessed through the number of agreements signed the range of services provided and feedback from service users regarding the accessibility and quality of care.

Wellness Travel Model

Lastly our third objective is to develop a wellness travel model which will be designed developed and ready for implementation within the first eighteen months. This model will provide frameworks for wellness-oriented travel experiences promoting mental and physical health benefits through carefully crafted travel packages. Wellness programs embedded in educational and travel contexts have shown positive impacts on well-being reducing

stress and improving mental health (Young et al. 2020). The model's success will be evaluated based on participant satisfaction measured through surveys and the repeat engagement rate indicating the model's appeal and effectiveness in enhancing participants' well-being.

Organizational Capacity

Foundation Structure and Management Capability:

The Global Happiness Initiative Foundation (GHIF) is designed to be a robust organization capable of managing large-scale projects and substantial grants. At its inception GHIF will establish a governance structure with a board of directors comprising education healthcare mental health and non-profit management experts. This board will provide strategic oversight and ensure all activities align with our mission and objectives.

Founding Team Expertise:

The founding team of GHIF will include highly qualified professionals selected for their extensive experience in project management international development healthcare and educational programming. Our recruitment strategy focuses on identifying individuals with a proven track record such as a Project Director with significant experience in managing and scaling community health programs an Education Specialist renowned for developing effective curricula in diverse cultural settings and a Mental Health Advocate with a strong background in leading global mental wellness initiatives. This planned assembly of expertise ensures a comprehensive and skilled approach to achieving the foundation's objectives.

Project Management Systems:

GHIF will implement rigorous project management methodologies to oversee all foundation activities. We will utilize established frameworks such as the Project Management Body of Knowledge (PMBOK) guidelines to plan execute monitor and close projects. Additionally GHIF will adopt modern project management tools for real-time tracking and reporting facilitating transparent and efficient management of the grant funds.

Preparatory Actions for Grant Management:

Prior to receiving the grant GHIF will:

- Formulate detailed project plans including timelines budgets and resource allocation.
- Establish financial management policies tailored to ensure accountability and prudent use of funds.
- Initiate discussions with potential partners and stakeholders to build a support network for immediate project launch upon funding.

Demonstrating Capacity through Strategic Intentions:

While GHIF is a nascent organization our strategic planning reflects a clear and actionable roadmap for immediate impact upon funding. The foundation's goals are backed by a commitment to leverage the diverse skills of its team and the strategic insights of its board to establish a high-performing organization. GHIF's initial actions and detailed project preparations demonstrate our readiness and capability to effectively manage and utilize the grant to achieve significant social impact.

Cross-Sector Collaboration

The Global Happiness Initiative Foundation (GHIF) is committed to developing localized high-impact programs that serve as models for global implementation. To achieve this GHIF emphasizes cross-sector collaboration mainly focusing on strategic partnerships in Italy and the United States. These collaborations are designed to leverage regional strengths and address specific local needs ensuring the adaptability and effectiveness of our well-being services.

Localized Educational Partnerships

GHIF will collaborate with leading educational institutions in Italy and the United States to integrate well-being practices into educational curricula. This initiative will focus on regions with significant disparities in educational outcomes providing targeted interventions that are culturally and contextually relevant. Research indicates that collaborative learning environments and educational partnerships can significantly enhance student outcomes and well-being (Kilgo et al. 2015). Success in these partnerships will be evaluated based on academic improvements student well-being metrics and the

scalability of the programs to other regions.

Healthcare Alliances

GHIF plans to partner with healthcare organizations in Italy and the United States to increase access to quality health services. These partnerships will focus on integrating mental health services with primary care a critical need in both countries according to local health reports. Studies have shown cross-sector healthcare collaborations can improve health outcomes particularly when mental health services are integrated with primary care (Randall et al. 2023). By working with local health providers and community organizations these initiatives aim to create sustainable health improvement models suitable for global replication.

Public-Private Partnerships

GHIF will seek partnerships with local government bodies and private sectors in Italy and the United States to support infrastructure development vital to program delivery. These partnerships will help facilitate the creation of community wellness centers which will serve as hubs for education healthcare and community activities. Effective public-private partnerships have been shown to significantly enhance community health and well-being (Ovseiko et al. 2014). The effectiveness of these centers will be measured through community engagement rates and the overall improvement in community health and educational outcomes.

Community Engagement

Integral to our strategy is the direct involvement of local communities in Italy and the United States in the planning and implementation phases. GHIF believes that community input is essential to tailoring programs that genuinely reflect and meet local needs. Feedback mechanisms and community advisory boards will be established to monitor the programs' impacts and guide iterative improvements as evidence proves that community involvement is crucial for the success and sustainability of public health programs (Mattessich & Rausch 2014).

Program Plan

Introduction to Program Strategy

The Global Happiness Initiative Foundation (GHIF) is committed to addressing critical needs in communities across the United States and Italy. We implement multifaceted strategies that enhance individual well-being and community health specifically designed to complement rather than duplicate existing services. Our comprehensive approach leverages local strengths and targets specific challenges through innovative and sustainable solutions.

Integration with Government and Healthcare Services

Our initiative targets significant gaps in access to healthcare and government support services. These gaps have been identified through extensive community outreach and stakeholder engagement underscoring a pressing need for improved service accessibility and quality. To address these challenges GHIF plans to forge strategic alliances with local health departments and social service agencies creating a referral network that simplifies the process for individuals to access the services they need. This network aims to increase the efficiency and responsiveness of health and social care systems.

Partnership development is crucial for the success of our healthcare integration strategy. By collaborating with local health authorities and service providers we aim to establish robust partnerships that facilitate streamlined access to healthcare and support services. These partnerships will be foundational in building a comprehensive referral system that enhances service delivery and meets the specific needs of the communities we serve.

In addition to building partnerships GHIF will engage in advocacy and policy work to enhance healthcare delivery. We will work closely with policymakers to advocate for regulations and policies prioritizing the health and well-being of underrepresented communities. Our focus on advocacy aims to influence policy changes that improve healthcare accessibility and address systemic barriers in service delivery.

Training community health workers is another critical component of our strategy. GHIF will implement comprehensive training programs

designed to enhance the capabilities of health workers in assisting individuals effectively. These programs will focus on developing empathy technical skills and a deep understanding of the healthcare system. This will ensure that community health workers are well-equipped to support individuals in navigating health and social services.

Wellness Travel Model

GHIF recognizes the therapeutic potential of travel in promoting mental and physical well-being. To harness this potential we are developing a Wellness Travel Model that integrates health benefits with cultural and educational experiences. This innovative approach to wellness extends beyond traditional health settings and includes travel packages that feature guided meditations wellness workshops and cultural tours. Each package is designed in collaboration with travel experts and cultural institutions to ensure that it offers genuine health benefits and facilitates cultural appreciation.

Community-based involvement is integral to the design and execution of our Wellness Travel Model. We engage local communities in developing travel experiences to ensure they are culturally respectful and enriching for visitors and hosts. This engagement helps create authentic travel experiences sensitive to the host communities' cultural dynamics and provides meaningful interactions that benefit all participants.

Holistic Educational Access

GHIF is also dedicated to transforming educational access by integrating a curriculum that includes advanced technology training and comprehensive arts education. This holistic approach aims to bridge the gap in technological and creative skills preparing individuals for the demands of the modern workforce and personal development. Our curriculum includes coding robotics visual arts and music training and is designed to be integrated into school systems and community learning centers.

GHIF will establish ongoing learning opportunities through workshops and seminars open to all age groups to complement our formal education initiatives. These initiatives focus on continuous skill development and personal growth promoting lifelong learning and adaptability. By offering workshops and seminars that cover a range of skills and artistic disciplines we aim to foster an environment of continuous learning and creative exploration.

Timeline and Evaluation

The timeline for these initiatives is strategically set to ensure a phased implementation. By the end of the second quarter of 2025 GHIF will establish the initial partnerships necessary for the referral systems and develop training programs for community health workers. Following the establishment of partnerships early in the same year the Wellness Travel Packages are expected to be launched by the third quarter of 2025. Educational program rollouts will begin in the fourth quarter of 2024 and be fully implemented across targeted regions by the second quarter of 2025.

Each element of the program plan is designed to measure specific outcomes related to access satisfaction and educational attainment ensuring that GHIF's interventions create measurable and sustainable impacts in the communities served. This strategic planning demonstrates GHIF's capability to manage a large grant effectively and fulfill its mission of building a foundation for long-term social change that contributes significantly to global well-being.

| Deliverables | Activities | Due Date | Expected Challenges |
|---------------------------------|---|----------|---|
| Set up Referral Systems | Establish partnerships develop training for staff | Q2 2025 | Regulatory hurdles securing partner cooperation |
| Launch Wellness Travel Packages | Design packages negotiate with travel agencies | Q3 2025 | Logistics coordination ensuring accessibility and inclusion |
| Rollout Educational Programs | Develop curricula and integrate into schools | Q4 2025 | Adaptation to local educational standards funding |
| Public Workshops and Seminars | Plan and implement workshops and lifelong learning seminars | Q1 | |

2026\t\nCommunity engagement sustaining interest over time\n\n\nReferences\nCunningham W. E. Hays R. D. Ettl M. K. Dixon W. J. Liu R. C.-C. Beck C. K. & Shapiro M. F. (1998). The prospective effect of access to medical care on health-related quality-of-life outcomes in patients with symptomatic HIV disease. *Medical Care* 36(3) 295\u2013306.\nDonne J. (2010). No man is an island. *Am Soc Neuroradiology*.\nGu D. Zhang Z. & Zeng Y. (2009). Access to healthcare services makes a difference in healthy longevity among older Chinese adults. *Social Science & Medicine* 68(2) 210\u2013219.\nKilgo C. A. Ezell Sheets J. K. & Pascarella E. T. (2015). The link between high-impact practices and student learning: Some longitudinal evidence. *Higher Education* 69 509\u2013525.\nKondiroli F. & Sunder N. (2022). Mental health effects of education. *Health Economics* 31 22\u201339.\nMattessich P. W. & Rausch E. J. (2014). Cross-sector collaboration to improve community health: A view of the current landscape. *Health Affairs* 33(11) 1968\u20131974.\nOvseiko P. V. O\u2019Sullivan C. Powell S. C. Davies S. M. & Buchan A. M. (2014). Implementation of collaborative governance in cross-sector innovation and education networks: Evidence from the National Health Service in England. *BMC Health Services Research* 14 1\u201314.\nRandall S. White D. & Dennis S. (2023). A collaborative primary health care model for children and young people in rural Australia: Explorations of cross-sectoral leader action. *Australian Journal of Primary Health*.\nRoss C. E. & Van Willigen M. (1997). Education and the subjective quality of life. *Journal of Health and Social Behavior* 275\u2013297.\nRoss C. E. & Wu C. (1995). The links between education and health. *American Sociological Review* 719\u2013745.\nSeid M. Varni J. W. Cummings L. & Schonlau M. (2006). The impact of realized access to care on health-related quality of life: A two-year prospective cohort study of children in the California State Children\u2019s Health Insurance Program. *The Journal of Pediatrics* 149(3) 354\u2013361.\nYoung T. Macinnes S. Jarden A. & Colla R. (2022). The impact of a wellbeing program imbedded in university classes: The importance of valuing happiness baseline wellbeing and practice frequency. *Studies in Higher Education* 47(4) 751\u2013770.

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 this\n00:00:07.770 brief overview of the Ben Avadh model a\n00:00:10.070 systematic
 process for engaging and\n00:00:12.570 developing relationships with
 individual\n00:00:14.700 donors who truly believe in your work\n00:00:16.980 and will
 support your organization for\n00:00:19.109 the long term this model was
 developed\n00:00:21.750 at an inner-city school and can be\n00:00:23.789 customized to
 any organization that is\n00:00:26.279 committed to getting off the year

to\n00:00:27.840 year fundraising treadmill and willing\n00:00:30.060 to follow this evidence-based\n00:00:31.640 step-by-step process if after watching\n00:00:34.860 this video you are serious about\n00:00:36.570 implementing the model I encourage you\n00:00:38.700 to watch our full 55 minute video on the\n00:00:41.280 Benetton website ok let's get started\n00:00:44.280 first thing you'll notice it's a circle\n00:00:46.710 think of it like an old-fashioned toy\n00:00:48.930 train track donors get on that track and\n00:00:51.329 go round and round for life they get on\n00:00:54.239 the track at step one with something we\n00:00:56.489 call a point of entry a sizzling one our\n00:00:59.489 get acquainted event rather than being a\n00:01:02.280 tour of your programs or your facilities\n00:01:04.260 this is a one-hour tour of your mission

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consistency and clarity in how the organization presents itself to potential and current supporters\u0013\u2013source\u0011. This ensures that the fundraising efforts are aligned with the organization\u2019s strategic objectives, enhancing both the effectiveness of the fundraising activities and the transparency towards the donors.\n\nThese elements are critical because they foster a sense of trust and alignment between the donors and the organization\u2019s goals, which is crucial for sustainable fundraising.\n\n### Part B: What are the two main differences between fundraising and sustainable fundraising. Support your answer with specific examples\n\nThe main difference between **fundraising and sustainable fundraising** lies in the timeframe and the depth of relationships established with donors. Traditional fundraising often focuses on short-term goals, such as meeting annual budgets or funding specific projects, and may employ transactional methods that prioritize immediate gains. For instance, traditional fundraising might include one-off campaigns or events that raise money quickly but don't necessarily engage donors beyond their initial contribution\u0012\u2013source\u0011. \n\nIn contrast, sustainable fundraising emphasizes **long-term relationships and donor retention**. This approach is rooted in the understanding that maintaining existing donors is more cost-effective and beneficial than continually acquiring new ones. Sustainable fundraising involves developing a deep understanding of donors\u2019 interests and motivations, and aligning them with the organization\u2019s long-term goals, thereby fostering a sense of shared commitment and ongoing support\u0012\u2013source\u0011. \n\nAnother difference is the **strategic approach** employed in sustainable fundraising. While traditional fundraising might react to immediate needs or opportunities, sustainable fundraising is proactive and based on a strategic plan that incorporates a diverse range of fundraising activities tailored to different donor segments. For example, the Benetton model of sustainable fundraising involves a circle or cycle that engages donors continuously, ensuring that they remain connected and supportive over the long term\u0015\u2013source\u0011. \n\n### Part C: Review the 2020 Nonprofit Leadership Impact Study. Based on the findings, what information did you find surprising, relevant to you and your organization, and helpful (please capture all three)?\n\nThe **2020 Nonprofit Leadership Impact Study** provided several insightful findings that are particularly relevant to the Global Happiness Initiative Foundation (GHIF). \n\n**Surprising**: It was surprising to learn the extent to which nonprofit leaders prioritize adapting technology and innovation within their strategic planning. The focus on technological advancement as a means to enhance organizational reach and efficiency underlines a significant shift from traditional nonprofit operational strategies, reflecting a broader trend of digital transformation across sectors. \n\n**Relevant**: The study\u2019s emphasis on the importance of leadership development and succession planning is highly relevant to GHIF. As a growing foundation, ensuring that leadership skills and knowledge are nurtured within the organization is crucial for sustainability and effectiveness. This insight supports the foundation's intention to invest in leadership training and development as part of its strategic objectives\u0014\u2013source\u0011. \n\n**Helpful**: The finding that effective communication and donor transparency are key to retaining and engaging supporters was particularly helpful. This aligns with GHIF's approach to sustainable fundraising, where building trust and maintaining open lines of communication with donors are seen as fundamental to long-term success. This reinforces the need for GHIF to continue enhancing its communication strategies to keep donors well-informed and engaged in its

mission\source\3011.\n\nThese aspects of the study not only provide a confirmation of some of GHIF's existing strategies but also offer a roadmap for areas of improvement and emphasis, such as technology use and leadership development."]}, "status": "finished_successfully", "end_turn": true, "weight": 1.0, "metadata": {"citations": [{"start_ix": 657, "end_ix": 668, "citation_format_type": "tether Og", "metadata": {"type": "file", "name": "interview_nigel_harris_february_2017.pdf", "id": "file-faSFT4gDC8RosjpXC6QoWh52", "source": "my_files", "text": "\nInterview Nigel Harris\n\nDriving the case for a sustainable long-term approach to fundraising\nZilla Efrat speaks with Nigel Harris about longevity of relationships, relationship progression and the life-time value of donors.\n\nIf boards just focus on the revenue aspects of fundraising alone, they are missing a fundamental understanding of what fundraising is about and what drives it. That's the view of Nigel Harris, CEO of the Mater Foundation and chair of the Fundraising Institute of Australia, who believes it's vital for boards to think of fundraising far beyond just being an exchange or a transaction.\n\nIf you are doing things that are just about getting money, some of the consequences could include a disconnect and a disregard for the donor relationship because you are just focused on the organisation's needs rather than the donor's needs," he says.\n\nHe defines fundraising as a mechanism around people's desires to do something useful which, in essence, is philanthropy. This is then supported through the construct of meaningful relationships that must be focused on those willing to give, rather than what the organisation wants.\n\nHarris believes charity boards need to take a longer term, bigger picture perspective rather than focusing on meeting immediate needs. \n\nMany charities are just trying to survive in the short term, but he says: \n\nIf you really exist to serve a mission, it's likely that your mission is longitudinal and that it won't be achieved in months or even a couple of years. So unless you have a sustainable long-term approach to funding your mission, there's a fundamental question as to why you are actually there and even doing what you are doing. \n\nThat's confronting to many organisations because we can all be convinced of the good work we do. \n\nBut it all feeds back to the question: are you focusing on the transaction or the relationship? It's relationships that create value and meaning over time.\n\nHarris warns that boards focused just on short-term revenue may be wasting money by repeating activities and not re-engaging donors, rather than enjoying the long-term efficacy that comes through relationships.\n\nIn sales, it's far better to retain a customer than to acquire a new customer. The same is true in fundraising. It is far better to retain a donor than to acquire a new one," he says.\n\nHarris is concerned that some boards still talk about measurements like the costs of fundraising and apply basic ratios without considering the nature of fundraising and the desired outcomes.\n\nThere is a validity around a cost-based metric if it is considered in an informed context, but what I see happening is that organisations are using this in a very general way and are also seeking to use it in a comparative fashion, which makes no sense," says Harris.\n\nInstead, he believes boards should be asking for long-term measures not factors like the longevity of relationships, relationship progression and the life-time value of donors. And they should be looking at least three years ahead, although five years is better.\n\nQuestions around donor engagement are very important. Unless

you are really \nfocused on your market \u2014 that is, the \ndonor cohort \u2014 there is a massive risk \nof being very self-indulgent in how you \nare see your programs.\u2019\n\nIn addition to relationships, another \nlong-term funding risk that boards \nneed to consider are third party \nrepresentatives as the recent \n\u2018chuggers\u2019 class action against \nfundraising company Appco \ndemonstrates.\n\nWhile it often makes sense to use third \nparty representatives to raise funds, \nHarris says its vital that boards don\u2019t \nneglect their oversight of this area and \ncarefully watch how arrangements \naffect relationships with supporters.\n\n\u2018If you are compromising the nature of \nyour relationship with donors or the \nreputation of your organisation or if \nthere are questions around the way \nthe third party may be operating, this \nreally needs to be examined. From \na commercial perspective, it makes \nsense to look at this as a question \nacross different modalities, but it really \ndoes come back to the very specific \nand individual questions for each \norganisation. The way every board will \nanswer this will be slightly different. \n\n\u2018It\u2019s not a case of being so risk \naverse that you resist third party \nrepresentation, but it is necessary to \n\n6\n\nBoards focused just on short-term revenue \nmay be wasting money by repeating \nactivities and on re-engaging donors, \nrather than enjoying the long-term \nefficacy that comes through \nrelationships.\n\nunderstand the nature of the process, \nwhat you are outsourcing, what\u2019s \nhappening behind the fundraising \nactivity, who you are working with and \nwhy, what the risks are and how these \nare being managed and mitigated.\u2019\n\nRecent fundraising scandals in the UK \nwhere unscrupulous fundraisers were \naccused of targeting old and vulnerable \ngivers highlight just how important this \nunderstanding is, he says.\n\n\u2018Some people in your audience may be \nvulnerable \u2014 for example, they may be \nolder. But there are many older people \nwho are perfectly capable of making \ngood decisions and are at stage of their \nlives where they want to give back. You \ndon\u2019t have to avoid this market. You \njust need to be conscious about what \nconversations you are having with it.\u2019\n\nHarris continues: \u2018The whole \nproposition of asking people to support \nyou is factored around emotional \nengagement. It won\u2019t necessarily \nresonate with some and it will inevitably \ndisturb others. If fundraising is soft and \ncomfortable and no one remarks on it, \nyou are probably going to have a very \nineffective fundraising program that will \nhave little or no outcome.\n\n\u2018But if everyone\u2019s feathers are ruffled, \nthat\u2019s also a problem. Also of concern is \nif the people who present your message \nbehave in a way that\u2019s confronting, \ninappropriate or unnecessarily intrusive. \nThat\u2019s not okay.\u2019\n\nHarris adds that the oversight of \nvolunteers and staff is just important \nas that of third parties. They also \nrepresent the organisation and could \njust as easily damage its reputation or \nrelationship with its donors. And there\u2019s \nno easy way to prevent this.\n\n\u2018Organisations are built on the back \nof volunteer effort. You have greater \nmeans to exercise control over third \nparties through the commercial \narrangements than you have with \nvolunteers in so much as they have \ngoodwill and emotion,\u2019 says Harris.\n\n\u2018All you can do is be aware of the risk \nand mitigate that through the training \nand development of people and by \nobserving behaviours. We are talking \nabout a relationship-based activity. It\u2019s \nall about human interaction.\n\n\u2018Just understanding what the risks are \nand having them managed properly \nis the key to all of this. You can never \nremove the risks entirely.\u2019\n\nBoards also need to take a long-term \nview to the organisation\u2019s cultural \nhealth, its people and retaining staff, \nsays Harris.

\n\n\u2018Fundraising staff turnover in Australia \nis still around the 18 months\u2019 mark and \nthere are problems with the supply of \nstaff. You can\u2019t make good progress if \nthe nature of the job is all about long-\nterm relationships. It\u2019s costly to retrain \nand hire new people and this almost \nnever seems to be considered.\u2019\n\nHarris says many charities aren\u2019t \nprepared to spend money on things \nthat don\u2019t directly get a financial \nreturn. \u2018This gets back to the problem \nof short-termism. For example, we \n\ntalk about customer or donor care. If \never communication you have with \nyour supporters is around asking them \nfor their support, you are exercising \na very transactional approach in how \nyou go about your business. It\u2019s also \nimportant to engage the people that \nsupport you more broadly about what \nthey are supporting and what happens \nas a result of their support. That\u2019s good \ndonor stewardship, but the problem is \nthat it costs money.\u2019\n\nHe observes: \u2018A statistic I heard \nrecently was that around 85 per cent of \ndonations or gifts that are given occur \nthrough fundraising activity. So, even \nthough people are philanthropically \nwired, they won\u2019t find their way to \ngive on their own by and large. Thus, \nfundraising isn\u2019t a necessary evil. It\u2019s an \nimportant way to help people fulfil their \nown philanthropy.\u2019\n\nHarris also believes it\u2019s vital for boards \nto show leadership in philanthropy and \nto set the tone that encourages others \nto give. \u2018If you are asking others to give \nsupport, but your leaders aren\u2019t, then \nthere are some big questions to be \nasked. Lead from the front. That does \nnot mean giving the biggest gifts. It \njust means engaging in philanthropy \nin the same way as you are asking \nothers to.\u2019

\n\nGovernance Directions February 2017\n\n", "extra": {"cited_message_idx": 12, "search_result_idx": null, "evidence_text": "source", "cloud_doc_url": null}}}, {"start_ix": 898, "end_ix": 909, "citation_format_type": "tether_og", "metadata": {"type": "file", "name": "tactiq-free-transcript-XPS_nhwiVyc.txt", "id": "file-WCbtUrnuRduzyrXzXH0M1jsE", "source": "my_files", "text": "# tactiq.io free youtube transcript\n# Ten Minutes to Sustainable Funding\n# https://www.youtube.com/watch/XPS_nhwiVyc\n\n00:00:02.419 hi I'm Terry Axelrod the founder of Ben\n00:00:05.460 'van thank you for joining me for this\n00:00:07.770 brief overview of the Ben Avadh model a\n00:00:10.070 systematic process for engaging and\n00:00:12.570 developing relationships with individual\n00:00:14.700 donors who truly believe in your work\n00:00:16.980 and will support your organization for\n00:00:19.109 the long term this model was developed\n00:00:21.750 at an inner-city school and can be\n00:00:23.789 customized to any organization that is\n00:00:26.279 committed to getting off the year to\n00:00:27.840 year fundraising treadmill and willing\n00:00:30.060 to follow this evidence-based\n00:00:31.640 step-by-step process if after watching\n00:00:34.860 this video you are serious about\n00:00:36.570 implementing the model I encourage you\n00:00:38.700 to watch our full 55 minute video on the\n00:00:41.280 Benetton website ok let's get started\n00:00:44.280 first thing you'll notice it's a circle\n00:00:46.710 think of it like an old-fashioned toy\n00:00:48.930 train track donors get on that track and\n00:00:51.329 go round and round for life they get on\n00:00:54.239 the track at step one with something we\n00:00:56.489 call a point of entry a sizzling one our\n00:00:59.489 get acquainted event rather than being a\n00:01:02.280 tour of your programs or your facilities\n00:01:04.260 this is a one-hour tour of your mission\n\nThe file is too long and its contents have been truncated.\n", "extra": {"cited_message_idx": 15, "search_result_idx": null, "evidence_text": "source", "cloud_doc_url": null}}}, {"start_ix": 1372, "end_ix": 1383,

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