



ON THE PATH TO SUSTAINABILITY IN GULF COOPERATION COUNCIL STATES: READINESS FOR ENERGY TRANSITION¹

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Abstract:

Whilst stakeholders and policymakers in industry and academia increasingly use *circular* and *sustainable*, the terms are not clearly understood. Furthermore, the need for a switch from a current economic model (linear) to a circular one has been recognized globally by the major decision-makers. The shift from one mechanism to another experiences challenges in grasping the Circular Economy (CE) and Sustainability (S) principles: defining them, understanding the similarities and differences, and successfully applying them using the Triple Bottom Line (TBL) approach. Employing a systematic literature review, the paper aims to clarify the ambiguities and add to clarity by exploring the concepts and the relationship of CE and S by applying the TBL framework – social, environmental and economic variables. The gaps regarding relations to people and profit contribution are identified in the literature, and future research priorities and new frameworks are recommended. Finally, the objective is to ascertain whether a strategic approach to sustainability and measures are in place in the Gulf Cooperation Council (GCC), such as increased investment in renewable energy infrastructure that could positively affect energy transition readiness, evidenced by energy efficiency indicators (reduced carbon emissions). Hence, three GCC countries were selected, their goals, and challenges were explored, and further research was recommended.

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INTRODUCTION

In the 20th century, through inventions and industrial and technological development, nature and its cycle have been harmed more than ever. Towards the end of this period, however, it feels that humans started waking up – it was not possible to continue this way; mechanisms were needed to reverse the impact made.

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That is how Sustainability (S) as a concept that means more than business sustainability appeared only in the second half of the 20th century (Ruggerio, 2021). Furthermore, Circular Economy (CE) was born, the idea that humans can mimic nature and close loops in the way they produce, use, recycle, repurpose, repair or, when repairing is not possible, remanufacture. Its features, according to Geissdoerfer *et al.* (2017) are comparable to those of S. Finally, when the Triple Bottom Line (TBL) framework emerged (Elkington, 2013a), so did the need to clarify the concepts, define their relationship and successfully apply them on micro, macro and meso levels (Nikolaou *et al.*, 2021a).

This paper sets out to clarify some of the ambiguities and add to clarity by exploring the relationship (whether CE contributes to S) between the two concepts, and how the TBL paradigm relates to them through systematizing different views in the available literature within the existing frameworks. Considering the topic's significance and the amount of literature available, the authors focus mainly on sources published after the year 2010 to demonstrate the latest findings and approaches to this relatively new field whose first publications appeared in 2007.

Building on previous work, this article further investigates how the ambiguities might affect the efficient integration of the concepts into practice and whether a better understanding of the terminology and concepts contributes to bridging the gaps in their application. It aims to provide conceptual clarity by analyzing the concepts, their relationships, and their implementation that would benefit all stakeholders, not only shareholders. Finally, the challenges and potential for further research are identified and the conclusion is made that the social and economic aspects have not been given enough attention and the application of the concepts has not been regulated. Therefore, a new framework is developed and ideas for further research where people and profit are substantially explored are recommended. Some studies show (Wakil & Oladapo, 2019) that reviewing energy policy to encourage investment in renewable energy projects is essential for finding a sustainable solution. This approach aims to address the energy crisis, generate employment opportunities, and reduce the environmental pollution associated with prolonged fossil fuel use. Ultimately, a focus has been given to one region, the Gulf Cooperation Council (GCC) area, three countries from this area have been selected – Oman, the Kingdom of Saudi Arabia (KSA) and the United Arab Emirates (UAE) and their goals and policies regarding the transition to more sustainable practices explored, the central focus being on the two sustainable development goals, SDG 7, Affordable and Clean Energy and SDG 9, Industry, Innovation and Infrastructure and the indicators which measure the progress in achieving these goals share of renewables in final energy consumption, energy intensity and carbon dioxide (CO₂) emission indicators.

LITERATURE REVIEW

The notion that there is a need for S, CE and TBL to be thoroughly explored has of late resonated within industry stakeholders on different levels (national and global) as well as academics – from less than 100 articles researched and published on the topic ten years ago, 2022 saw more than 4000 articles published (Figge *et al.*, 2023) defining, or trying to define, CE and its application. The first article was published in 2007, and over two-thirds of papers on CE were published in 2015-2017 (Reike *et al.*, 2018). Stahel, MacArthur, and Elkington are among the pioneers while Figge and Svenson Thrope stand out when it comes to recent CE articles. The Journal of Industrial Ecology was the first one to rebrand and incorporate CE, while the Journal of Cleaner Production is the one that publishes most scientific papers that deal with CE and S (Kirchherr *et al.*, 2023). This section has been divided into subsections to classify relevant information that explains CE, analyze S, and identify the TBL relevance and challenges. Finally, it contains the relevant findings.



Circular Economy

According to Figge *et al.* (2023), more than 100 CE definitions are available but two major ones have been shared here. Kirchherr *et al.* (2017) reviewed the existing definitions and proposed their own according to which CE refers to a framework that consists of business models which no longer deal with end-of-life principles; instead, this concept aims to minimize waste through reduction, reuse, recycling, and material recovery through the mechanisms of consumption, distribution and production. This approach, according to the authors, works through various levels including companies, products and consumers at the micro level, eco-industrial parks at the meso level and cities, regions, and nations at the macro level. Over the past twenty years, research in both theory and practice regarding CE has delivered frameworks, guidance, and models that enable a quicker and more efficient application of the concept (Popović *et al.*, 2022). The ultimate goal is achieving sustainable development which encompasses fostering social equity, ensuring economic prosperity and promoting environmental well-being to bring meaningful outcomes for current, and generations to come.

Figge *et al.* (2023) argue that the former definition is insufficient, confusing, and broad but also too narrow. They offer their definition stipulating that the CE is a multi-tiered mechanism that uses resources so that all loops are ultimately closed. Reusing, recycling, and other methods help with resource optimization and flow, adding to effective circularity. Ideally, all resource loops will be closed and there will be no waste and no need for more resources. However, sourcing virgin materials seems unavoidable. According to Radovanov *et al.* (2023) the "business as usual" model leads to us using resources each year at a rate equivalent to 1.5 times what the Earth can provide.

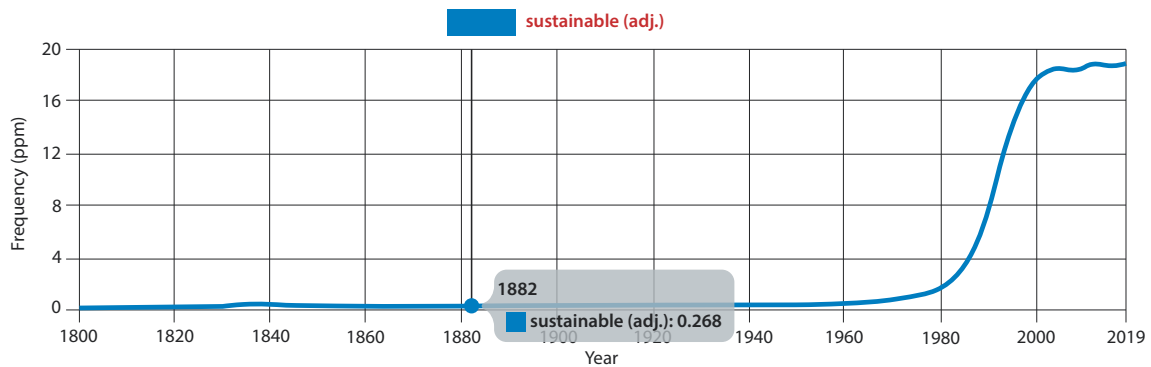
The first half of the 20th century saw the conception of CE in the form of recycling in Germany, closed-loop (waste management) in Switzerland, and product life cycle in Belgium (Reike *et al.*, 2018). However, it was not until the 1970s that circularity started being seen as necessary, and Stahel is considered its founding father (Ekins *et al.*, 2020). Finally, Stahel (2016) writes it is high time CE was introduced through vocational and academic training – all must be aware and start applying it. One of the attempts to regulate CE activities was made by MacArthur (MacArthur, 2013) who made a shift to a circular economy in industry and academia. Starting with the Ellen MacArthur Foundation, CE has therefore been perceived as a tool, a business model for Sustainable Development (How to Build a Circular Economy | Ellen MacArthur Foundation, n.d.-b).



Sustainability

It is relevant to note that the usage of the word sustainable rises exponentially after the year 1980, as seen in Figure 1.

Figure 1. The use of the word sustainable



Source: *Online Etymology Dictionary*

A possible explanation of this trend is that the term sustainable development was for the first time used in the UN World Commission on Environment and Development (WCED) report published in 1987 by (Leal Filho *et al.*, 2015) when so-called Brundtland Report (another title given after the then Prime Minister of Norway who chaired WCED) defined the phrase as development that fulfils present requirements while preserving the capability of coming generations to meet their requirements (Reike *et al.*, 2018).

Social, economic, and environmental issues were finally recognized, while their interrelation and the importance of finding an equilibrium between economic expansion, social well-being, and environmental protection were emphasized. Initially, the term sustainable was mostly used in connection with economic development; however, after the Eco-Rio, a UN Conference on Environment and Development held in Brazil in 1992 (United Nations, n.d.), the meaning of the phrase was more holistic referring to enhancing the social and economic variables like poverty relief, unemployment, inequality, health, better food, housing and education (United Nations, n.d.-b). Both S and CE concepts attempt to include non-economic components in development (Geissdoerfer *et al.*, 2017).



Triple Bottom Line

TBL was founded in 1994 by John Elkington, a British entrepreneur and author, one of the leading figures in social responsibility and sustainability. People, Planet and Profit (PPP) are balanced and essential elements representing sustainability (Admin & Admin, 2023). The framework below shows that the financial bottom line that businesses are concerned with is too limited, and this framework offers a holistic approach leading to sustainable development (Elkington, 2013a).

Figure 2. TBL framework and the interconnection of elements



Source: Open-source license: CC BY 4.0

Elkington (2013) felt the framework had been criticized mostly for not contributing to the people and planet aspects. Eventually, the founder decided to ‘recall’ the concept in the article he published in Harvard Business Review (2018).

Although the CE concept appears to be the oldest of the three, it only developed in the current form in the last decade. It is the most limited in nature as it does not deal with the social aspect but mostly with disposing of pollution and waste efficiently, materials and products circulation, and nature regeneration according to MacArthur (2010). However, it has been gaining momentum - the academe has recognized its importance and many research papers published recently. Sustainable development deals with a wider scope and especially after the formation of Sustainable Development Goals (SDG) in 2012, CE has been seen as a mechanism to promote sustainability goals (Nikolaou *et al.*, 2021a). The TBL appeared, says its founder Elkington, as a response to the need to clarify S and bring it closer to business decision-makers.



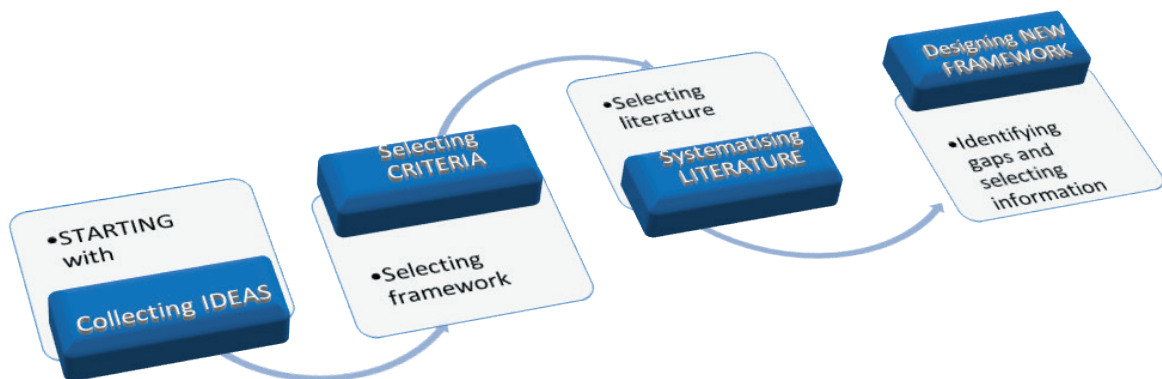
RESEARCH METHODOLOGY STAGES

For this research, over forty scientific papers and other relevant sources have been cited out of more than fifty publications found which will be used for the upcoming scientific research. While exploring the general concepts of sustainability and the related frameworks, international journal articles have been mainly read and cited; for the second part, related to the implementation of sustainable aspects in GCC countries, the authors found reports to be the most beneficial and relevant. The methodology used is a systematic literature review, the steps are shown in Figure 3.

The first few steps consisted of gathering ideas and selecting literature by setting relevant, specific, criteria to research scientific databases. The inclusion criteria used in this step were: a) publication type – only peer-reviewed articles were included and relevant renowned books and sources (such as Ellen McArthur Foundation); b) time frame – mostly articles written/published after 2010 were selected as a source; however, some older relevant sources were included (TBL founder's articles, for instance); c) language – only sources found in English were included; d) context -global; e) themes - mainly articles that focus on defining, explaining CE (Subtopic one), those that analyze Sustainability Strategies (Subtopic two) and finally, the sources that explore TBL and its connection with the previous two concepts (Subtopic three) were read, and cited, in this paper. To ensure quality, mostly peer-reviewed scientific papers were chosen, but other sources were also cited - reports, the Ellen McArthur Foundation, and Harvard Business Review. The reason for including non-peer-reviewed sources was considered adequate as CE and S are new research areas and the two concepts have not yet been comprehensively explored.

The above research stages provide a concrete framework used to analyze the relationship between CE and S in both industry and academia globally. Then, the relevant literature was read and examined/systematized in order to identify trends, challenges and gaps. Finally, a new framework was developed.

Figure 3. The stages of methodology



Source: the authors

In phase two of this research, SD application in a real-world context has been tackled and the trend of two SDGs for the chosen (relevant) indicators has been evaluated. Three countries in the GCC region have been observed, the Sultanate of Oman, the United Arab Emirates and the Kingdom of Saudi Arabia, in terms of their readiness and actions towards adopting more renewable energy sources. To that end, the trend showing three indicators (CO₂ emissions, share of renewables and energy intensity) has been analyzed for 30 years (from 1990 until 2020) and presented in this study.



RESULTS AND DISCUSSION

Sustainability Frameworks

This section analyses the three frameworks in the way they are understood and presented in the literature, their timeline, and the way they are applied. Arruda *et al.* (2021) believe that it is difficult to predict how the CE evolution will develop due to a lack of clarity in interpreting the term. However, they speak about different periods in CE development and have noticed the pattern in publications and different aspects of CE from 2015 to 2020 (Table 1).

Table 1. Time frames and different periods of CE

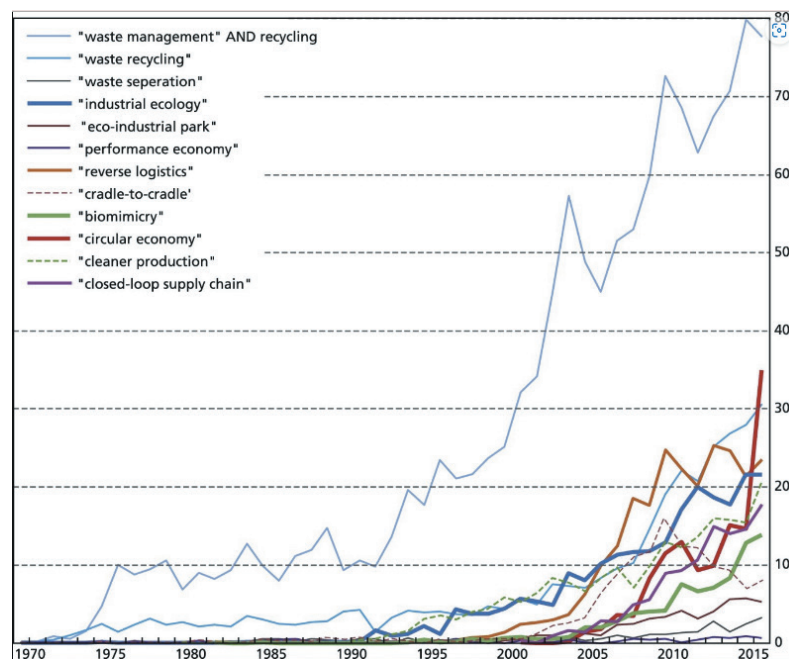
Year(s)	Period name
1960-1985	Preamble period
1985-2013	Excitation period
2013-Present*	Validity challenge period

*The research period ended in 2020

Source: Aruda *et al.* (2021)

Reike *et al.* (2018) gave an account of the CE publications from 2004 to 2015 (Figure 4). The majority of literature is written on recycling and waste management, waste recycling follows while a large number of the other concepts did not appear in scientific papers until the 1990s. Notably, CE emerges only around or after the year 2000 which calls for the conclusion that this might be the time when the CE foundations are laid.

Figure 4. SCOPUS publication on CE and related themes

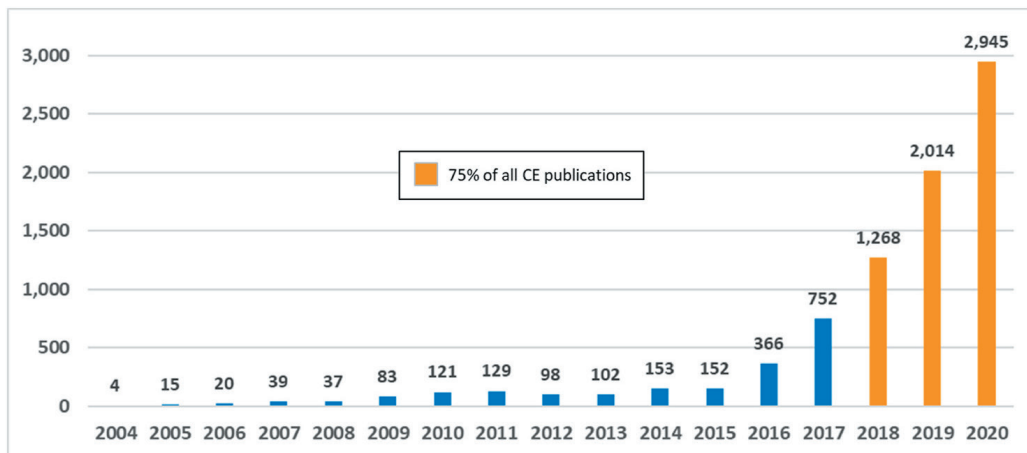


Source: Reike *et al.* (2018)



Upon these foundations, the CE structure was built. This was reflected in Nombre *et al.* (2021), in their attempt to define CE and its development, as well as present the publication history. They showed the rise of publications on CE (Figure 5.) where it can be observed that CE has been increasingly recognized and written about. In 2020, for instance, a comprehensive literature review was written to analyze and classify various CE models (Geissdoerfer *et al.*, 2020).

Figure 5. The CE publications, expansion over the years



Source: Nombre *et al.* (2021)

The Rio conference played a pivotal role in redefining the concept of S and incorporating it into the global policy-making system and documentation. Only after this conference, and (re)defining the term sustainable, did the other aspects and frameworks come into being – socio-economic and environmental. Thus, the term CE has been coined (Ekins *et al.*, 2020). Finally, the TBL framework, founded by Elkington in 1994, influenced CEOs and CFOs to move from profit-making to 'people making' and 'environment making'.

Throughout the literature, there is consistent evidence that there are currently not enough policies (or in most countries, no policies at all) to regulate Corporate Social Responsibility (CSR) through CE, TBL and sustainability practices and reporting (Shnayder *et al.*, 2015). Indeed, in some countries the policies are there, Germany integrated CE into legislation in 1996 ("Closed Substance Cycle and Waste Management Act"), China in 2002 (to regulate energy efficiency) and Japan in 2002 ("The Basic Law for Establishing a Recycling-Based Society") (Su *et al.*, 2013). Although websites increasingly advise on clothes or electronics repair and some companies (e.g. Philips) offer repair for advanced technology equipment, it appears that most organizations, and countries, choose sustainable and CSR activities haphazardly and report on them in a way which benefits their image rather than society.

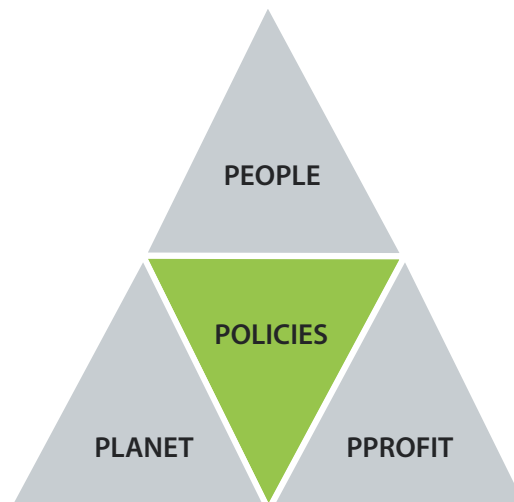
Shnayder *et al.* (2015) demonstrate how the CSR and S efforts of an organization can be misinforming. The foundation of the issue is measuring - there has been a challenge in finding the right way to measure the impact of applied sustainability mechanisms such as TBL accurately, meaningfully, and consistently. Thus, reporting on the impact and benefits might have to be taken sceptically. Realizing these challenges, the founder of the TBL framework, Elkington decided to recall the concept (Elkington, 2018). In June 2018, he expressed in Harvard Business Review that the concept had not been utilized as its core value suggested and as the author intended; he felt that stakeholders still calculated mostly profit (finances)



using the TBL paradigm. The TBL was meant to inspire reflection on capitalism and its prospects, but the accountants and reporting consultants diluted the concept which was meant to add a genuine value to decision-makers in their managing of activities and by doing so, contribute to the improvement of human conditions. In short, while everyone was still focused on profit margins, people and planet ‘margins’ were not made the priority.

Consequently, the conclusion was made by the authors that the TBL needs to be enhanced to be applied systematically across sectors. This study disagrees with recalling the TBL concept; instead, a paradigm shift is needed. To that end, an additional element has been proposed, the fourth P which stands for *policy*, a prerequisite for other Ps (Figure 6). This new P will ensure that legislation is in place to regulate fair, meaningful, and sustainable benefits for all. Crucially, the Four Ps Pyramid proposes firm policy implementation – a detailed and strictly regulated legislative system that oversees the execution and measurement of SDGs, including clear incentives and penalties. The new framework must be distinguished from the Quadruple Bottom Line (QBL) which comprises People, Planet, Profit and Purpose (Tiller *et al.*, 2022) as the P in our framework is not the bottom line; indeed, it is a basis for Elkington’s paradigm to be successful.

Figure 6. Four Ps Pyramid



Source: the authors



Gulf Cooperation Council Readiness for Sustainable Energy Transition

GCC was founded in Abu Dhabi, United Arab Emirates where an agreement was signed between the United Arab Emirates, the Kingdom of Saudi Arabia, Oman, Bahrain, Kuwait and Qatar on May 25, 1981. This collaboration was founded upon the common value system, shared cultural and political systems rooted in Islamic principles, proximate geography, Arabic language, and strong relationships (*The Charter*, n.d.). Although the big portions of these countries are covered in desert, most people live an urban life in the major cities such as Dubai, Abu Dhabi, and Riyadh. The geography is diverse and includes, in addition to deserts, wadis (riverbeds), mountain ranges with low temperatures and occasional snowfall, fjords and forests. Close to 60 million people are estimated to live in these six countries. The official language is Arabic and Islam is the dominant religion which, contrary to popular opinion, preaches peaceful and spiritual life (one of the meanings of the word Islam is peace and reconciliation among humanity).

One of the mutual characteristics for all the GCC countries is that they are the top oil and gas producers globally with Saudi Arabia, United Arab Emirates and Kuwait among the first ten oil-rich countries occupying second, seventh and tenth place respectively. These six countries together constitute 45% of the world's total oil reserves, and 25% of global crude oil exports (Iqbal, n.d.). Furthermore, this region is one of the high environmental polluters (*Middle East – Countries & Regions - IEA*, n.d.) evidenced by the fact that the GCC states saw an increment of 104% in CO₂ emissions from 2000 to 2021, 11% of global share, which brings the conclusion they are in need of the economy diversification and more systematic focus on energy transition and achieving the SDGs.

For the purposes of this study, the analysis will be carried out on three countries of the GCC region – Oman, Saudi Arabia and the United Arab Emirates. The energy sector in these countries can be explored by looking into the main energy indicators (*Middle East – Countries & Regions - IEA*, n.d.). Major energy resources in this region consist of hydrocarbons, mainly crude oil and natural gas all of which emit substantial amounts of CO₂ throughout production and consumption. Table 2 below presents the total energy supply with oil being the most prevalent resource in Oman and Saudi Arabia, while the United Arab Emirates provides natural gas more; none of the countries has much coal reserves but a portion of renewable energy can be found with the United Arab Emirates having the higher percentage of the three countries. Table 2 also shows that the highest energy supply comes from Saudi Arabia and the lowest from Oman. This can be explained by the fact that Saudi Arabia was the top exporter of fossil fuels globally in 2021 which also makes it the country with the largest carbon footprint – in the same year its CO₂ emissions reached almost 500 mt, substantially more than Oman's and United Arab Emirates's emission which measured 69.7 mt and 180.67 mt respectively.

Table 2. Energy supply in 2021, TJ

Country	Total supply/TJ	Oil supply/TJ	Natural gas/TJ	Renewables share of power generation %
Oman	1118503	105608	1011956	0.6
Saudi Arabia	9726031	6270562	3450928	0.3
UAE	3593251	1067940	2280012	4.2

Source: *Middle East – Countries & Regions - IEA*, n.d.



Having abundant oil and gas reserves led these countries to heavily rely on hydrocarbons for their economic advancement. Indeed, oil and gas exports account for a substantial portion of this region's Gross Domestic Product (GDP). While in terms of GDP being oil-dependent may have a positive effect on some countries, Maalel, N. (2018) claims that relying on oil export negatively impacts the economic growth of the United Arab Emirates and Saudi Arabia and that this is not necessarily conducive to economic development in GCC countries. As oil contributed one-third of the total GDP in the region (Iqbal, n.d.), the economic progress was heavily dependent on oil exports and exposed to external shocks. For example, due to COVID pandemic and the reduced oil demands, OPEC+ reduced production and in April 2023, the members of OPEC+ agreed to lower the production again (*OPEC+: Oil Output Cuts by Member State 2023 | Statista, 2024*) with some countries decreasing it voluntarily to balance the oil market: Saudi Arabia would cut 500 000 barrels per day, United Arab Emirates 144 000 and Oman 40 000 of oil barrels per day. This influenced the countries to start policy reforms aimed at non-oil sector expansion and to generate job opportunities for a rapidly growing labour force (diversification).

Nevertheless, the countries in the Gulf showed a strong ability to withstand adversity in times of recent crises. Based on the GDP per capita, the GCC states belong to the high-income level category (Van Rompaey Eric Metreau Shwetha Grace Eapen *et al.*, 2023), table 3 below. Furthermore, the rate of unemployment was also kept comparatively low (the global unemployment percentage was 5.4 in 2022) in most countries except Saudi Arabia where it was slightly above 5%. When it comes to inflation rates, while the majority of the countries battled high inflation in 2022 (the global average rate was 8.27%), inflation averaged around 1.5% in 2021 to 4.2% in 2022 (Fareed, 2023) in the GCC region.

Table 3. Main macroeconomic indicators and energy transition indicators

Country	GDP per capita USD	Inflation, average % in 2023	Unemployment rate, %	Carbon emission per capita, t in 2021	Energy consumption, % in 2022
Oman	19,510	1.27	3.30	15.4	5.41
KSA	23,185	1.6	5.12	13.8	6.89
UAE	44,315	3.12	2.95	19.3	7.12

Source: (Worldometer - Real-Time World Statistics, n.d.)

Since the 1970s, the predominant focus of the GCC region has been economic growth based on job creation (mostly employment in state administration available to citizens, while industry jobs are reserved for the foreign workforce), relying on fossil fuel export for substantial revenue generation, and energy and water subsidies. These subsidies, combined with volatility in oil and gas production levels and prices, present some of the major challenges for the healthy economy in the region and were the cause for the reforms to begin between 2014 and 2016 (Al-Saidi, 2020); in fact, high energy and water subsidization has adversely affected market-based competitiveness and hindered SD, due to heavy subsidization, the energy consumption was too high and presented a serious environmental threat. As per the data shown in Table 3, the total usage in Oman, United Arab Emirates and Saudi Arabia measured 5.41 percent, 7.12 percent, and 6.89 percent respectively, a significant disparity when compared to the global consumption of 1.1 percent. This naturally affected the CO₂ emission which per capita measured 15.4, 19.3 and 13.8 tons, notably higher than the world average of 4.3 t in the same year. According to Al-Saidi (2020), this has prompted the decision-makers in the region to start reforming the economy



by trying to disassociate its growth from ecological modernization. Moreover, the region's choices (Zaidan *et al.*, 2019), many of which are based on political economy and attempt for peaceful governance based on social benefits, have caused concerns regarding fiscal well-being and renewable resource utilization. The resistance to SD and energy transition is understandable in this region as it tries to protect their fossil fuels-based economy; however, prompted by the big changes in the Western world, and understanding the impact that hydrocarbon-based energy has on the environment (but also the fact that oil-dependency is not economically viable in the long run) many of the Gulf countries started planning changes towards economy diversification and a more sustainable future. Therefore, according to the IMF report (Dept, 2023), the momentum of non-hydrocarbon growth is strong as GCC countries endeavour to achieve socio-economic transformation through ambitious strategic visions: Oman Vision 2040, We the UAE 2031, and Saudi Vision 2030.

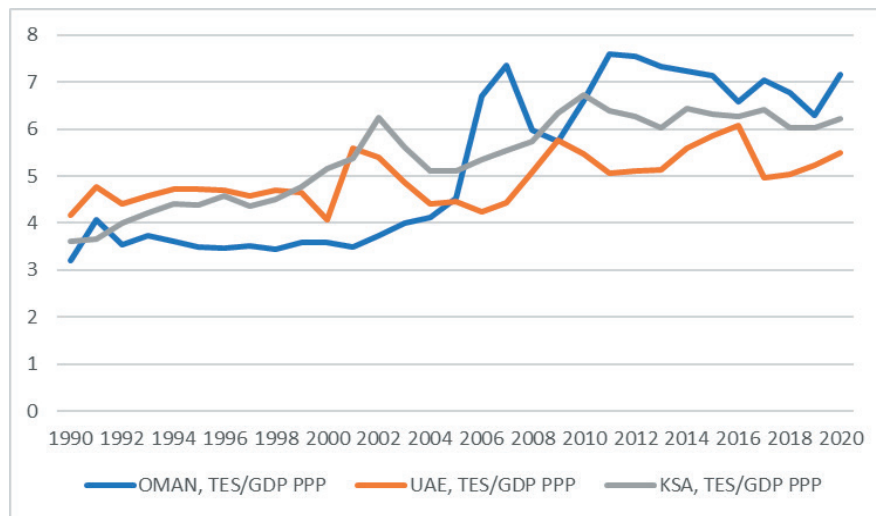
All these strategic documents contain sections on sustainability, specifically the environment and diverse energy resources. Nevertheless, *Sustainable Development Report 2023*. (n.d.) offers insight into these countries' ranking when it comes to the United Nations' 17 Sustainable Development Goals – Oman is ranked 90, Saudi Arabia 94 while United Arab Emirates is number 79 out of 193 countries which indicates that challenges toward achieving SDGs and sustainable future in the GCC region remain. *Arab Region SDG Index and Dashboards Report (2023, n.d.)* shows progress, or the lack thereof, towards SDGs in the Gulf countries, with a focus on the three countries chosen by the authors. Saudi Arabia has achieved only SDG 1 (No Poverty), the United Arab Emirates has reached two goals – SDG 1 (No Poverty) and SDG 10 (Reduced Inequalities) while Oman has not yet succeeded in any of the 17 SDGs. For all three countries, the major challenges represent Zero Hunger, Gender Equality, Climate Action and Peace, Justice and Strong Institutions whereas data for Reduced Inequalities in Oman and Saudi Arabia is not available.

Among 17 SDGs, for the purpose of this study, the focus is on SDG7 (Affordable and Clean Energy), its indicators for the targets 7.1, 7.2, 7.3, and SDG9 (Industry, Innovation and Infrastructure) and its target 9.4 which is related to increased resource-use efficiency and greater adoption of clean and environmentally sound technologies (the indicators presented are CO₂ emissions per unit of GDP).

Goal number SDG7 is concerned with making sure that there is access to modern, sustainable, reliable and affordable energy for everyone and has five targets to deal with the fact that coal, oil and fossil fuel (gas) contribute to almost 90% of global CO₂ emissions (*International Day of Clean Energy United Nations*, n.d.). Data regarding target number 7.1 (Proportion of population with access to electricity) shows that in 2022, all the people in the United Arab Emirates (100%) had access to electricity, while in Oman, the results show 99.3%. There is currently no available data for Saudi Arabia. Figure 7 below shows the three countries' status with regards to SDG 7.2, Renewable share (denote the renewable energy sources which have been developed using modern technologies and are considered more sophisticated and advanced than traditional renewables, such as wind turbines vs. windmills) in final energy consumption while Figure 8 presents SDG 7.3, Energy intensity per unit of GDP.



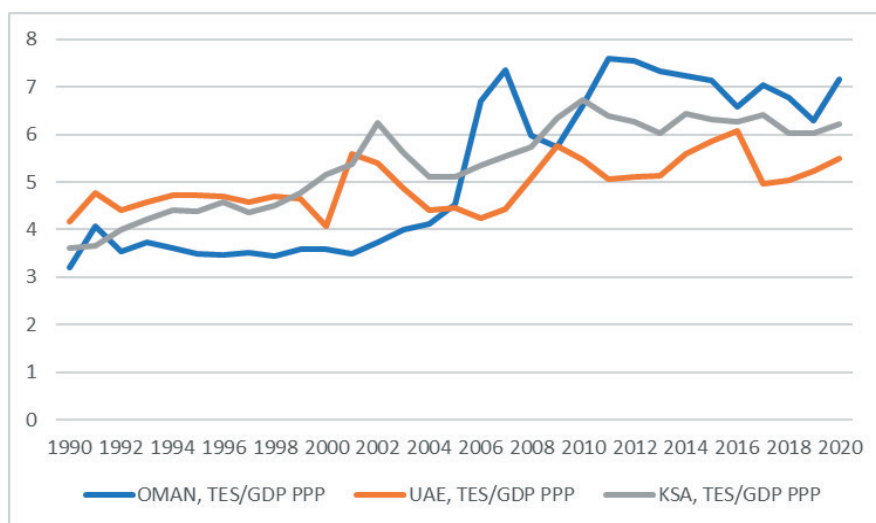
Figure 7. Share of renewables in Oman UAE, KSA in percentages (SDG 7.2)



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Concerning SDG 7.2. (Figure 7 above) the share of renewables is minimal with Oman and Saudi Arabia sharing similar results, almost 0.1%. United Arab Emirates' data shows a bit higher value – 0.9%. The share of these three countries (barely surpassing 1% in total) shows this region's struggle with energy transition especially when compared with the indicators showing global modern renewables share starting with 6.3% in 1990 and increasing to 12.5% in 2021. The second line graph concerning GDP 7.3, Figure 8 below, shows that the energy intensity in all three countries is on the rise with Oman showing 7.2, United Arab Emirates 5.5 and Saudi Arabia 6.2 MJ/2015USD PPP. This is contradictory to the trend of the world – the same indicator on a global level shows a steady decrease starting with 7.0 MJ/2015USD PPP in 1990 and falling to 4.6 MJ/2015USD PPP in 2021.

Figure 8. Energy Intensity per Unit of GDP for Oman, UAE and KSA in MJ per 2015 USD PPP (SDG 7.3)

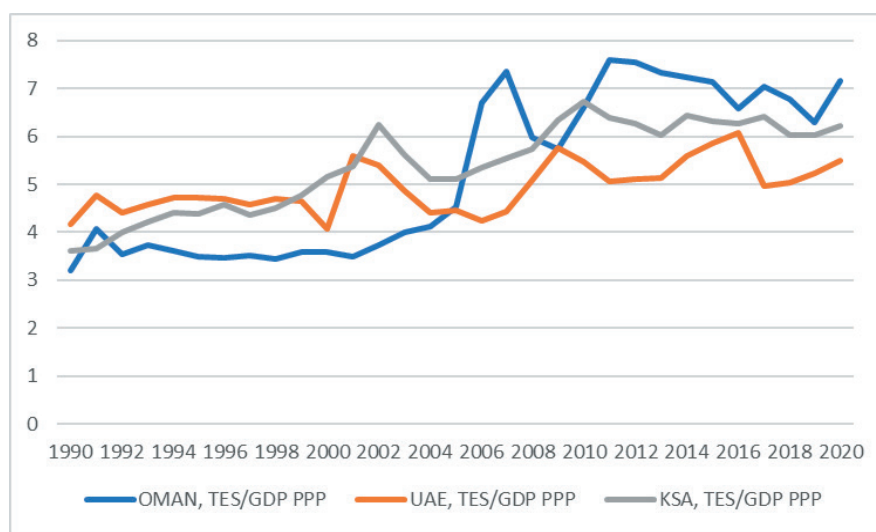


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Finally, the paper explores SDG 9, with a special focus on 9.4 which aims to ensure sustainability by enhancing resource use efficiency and by adopting environmentally friendly technologies and upgrading infrastructure. The indicators presented demonstrate CO₂ emissions per unit of GDP for Oman, United Arab Emirates and Saudi Arabia, Figure 9 below, whereby it is observed that Oman and Saudi Arabia show an upward trend with Oman starting with 0.4 in 1990 and increasing to 0.8 kgCO₂ / 2015USD in 2021 and Saudi Arabia moving up slightly over the same period, from 0.5 to 0.7 kgCO₂ / 2015USD. The United Arab Emirates differs as it shows no change throughout the same period starting and ending with 0.4 kgCO₂ / 2015USD with a small increase to 0.5 kgCO₂ / 2015USD between 2008 and 2017. These trends are discrepant when compared to the global indicators that show a drop over the same period – 0.6 to 0.4 kgCO₂ / 2015USD.

Figure 9. CO₂ Emissions per unit of GDP in kgCO₂/2015USD (SDG 9.4)



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Looking at main emission drivers, *Energy Statistics Data Browser – Data Tools - IEA*, n.d. shows clearly that one of the main driving forces behind the CO₂ emissions upward trend is the increase in population. The population in Oman saw a 150% increase between 1990 and 2021, Saudi Arabia experienced a 125% rise for the same period while the United Arab Emirates shows the highest change of all with a 426% difference in the number of people measured in 2021. Additionally, another prominent driver appears to be a growing standard of living, i.e. the increase in GDP per capita. Oman's data shows a GDP of 6,475.4 USD per capita in 1990, after some fluctuation, the GDP in 2022 measures 25,056.8 USD/per capita, (*World Bank Open Data*, n.d.), United Arab Emirates started with 26,682.8 USD/capita in 1990, fluctuated a bit but dropped in 2009, and came back up to 53,708 USD/capita in 2022. Saudi Arabia shows the most frequent and extreme fluctuations of the three countries: in 1990 it showed 7,349.7 USD per person; it dropped many times but there were two extreme decreases in 1999 and 2010 respectively and two sharp increases in 2003 and 2011 with the final data in 2022 showing 30,447.9 USD/capita. Contrasted with the world where we can see that globally in 1990, GDP per capita measured 4,332.8 USD and in 2022 12,687.7 USD/per capita, these three countries have comparatively high living standards and based on (*WDI - the World by Income and Region*, n.d.) belong to the high-income group of countries.



As GCC countries are signatories of the Paris Agreement and are among the top 10 in the world for carbon footprint per capita, they have, as of recently, started to make plans for reducing their carbon emissions through a variety of projects. Oman and the United Arab Emirates announced their target - net zero by 2050, (Khan & Al-Ghamdi, 2023), Saudi Arabia plans net zero by 2060 while Kuwait and Qatar aim for 7.4% and 25% reduction respectively by 2035 which shows that the region is planning to focus on the hydrogen economy. Table 4 below shows the countries' commitments to renewable energy. Khan & Al-Ghamdi, (2023) state that nationally determined contributions (NDC), sunshine almost all year round (360 days per year on average), large areas of land, sources of funding and energy business expertise are the main strengths of the area to explore hydrogen market. The biggest challenges to the development of the hydrogen economy, however, present hydrocarbon-dependent revenue generation, lack of private sector involvement and non-systematic hydrogen strategy.

Table 4. Commitments toward energy transitions

Country	Paris agreement ratification	NDC adoption	Net zero targets
Oman	2019	First INDC in 2019, updated to NDC in 2021	By 2050
KSA	2016	First in 2016 updated in 2021	By 2060
UAE	2016	First in 2016, updated in 2020	By 2050

Sources: (United Nations, n.d.), (Elliott et al., 2023)

In all the Gulf states, Saudi Arabia and UAE lead in the areas of research and development of projects concentrated on energy transition. These two countries combined hold more than 92% of the Gulf's total generation capacity (2.82 GW) for wind and solar power generation (Seznec Samer Mosis, 2021). Up to the year 2021, there were a few projects in this area to generate renewable energy (Table 5). According to Seznec Samer Mosis (2021), seven projects (out of 12) were being conducted in two Emirates, Dubai and Abu Dhabi, with two initiatives in Saudi Arabia and Oman respectively.

**Table 5.** The Gulf region's renewable energy projects

Country	Project	In Operation		
		Capacity (GW)	Start date	Type
UAE: Abu Dhabi	Shams	0.1	2013	CSP
UAE: Dubai	MBR Solar P2	0.01	2013	Solar
UAE: Dubai	MBR Solar P1	0.2	2017	Solar
UAE: Dubai	MBR Solar P3.1	0.2	2018	Solar
Kuwait	al-Shagaya	0.07	2019	Mixed
Oman	Dhofar	0.05	2019	Wind
Saudi Arabia	Layla al-Aflaj	0.01	2019	Solar
UAE: Abu Dhabi	Sweihan	1.18	2019	Solar
UAE: Dubai	MBR Solar P3.2	0.3	2019	Solar
Oman	Amin	0.1	2020	Solar
UAE: Dubai	MBR Solar P3.3	0.3	2020	Solar
Saudi Arabia	Sakaka	0.3	2021	Solar
Total Operating in the Arab Gulf		2.82		
Operating in the KSA and UAE		2.6		

Source: *Seznec Samer Mosis. (2021)*

Despite all the efforts discussed above, it can be observed that the Gulf countries have not had a systematic approach and have not implemented processes and techniques that would make a significant sustainability impact. Al-Saidi (2022) discusses a few challenges for the status of SDGs in GCC countries. He believes that there is no comprehensive analysis done on which SDGs to tackle, and no systematic approach, which leads to poor implementation and incomplete reporting. In addition, Allen *et al.* (2017) suggest that the countries of this region choose their priorities based on values such as peace, human rights and well-being, and environmental sustainability. Setting priorities is what missing, according to Al-Saidi (2022) who claims that thus far, the SDG agenda has not been systematically set by the GCC policymakers which leads to minor and haphazard attempts to implement sustainable practices in organizations and governments. The author believes that spreading awareness of sustainability and environmental challenges will benefit the Gulf region and enhance more systematic actions. Education for Sustainable Development (ESD), according to Kioupi & Voulvoulis (2019) must be promoted everywhere.



CONCLUSION

Considering the above information, a conclusion has been made related to the three states in the GCC area, Oman, the Kingdom of Saudi Arabia and the United Arab Emirates and their energy transition to more sustainable practices and reaching SDGs specifically 7.1, 7.2, 7.3 and 9.4. Consequently, the identified and selected data shows, with regards to SDG 7.1, that there is access to electricity for all people in UAE, most people in Oman, while Saudi Arabian data is currently not available. When it comes to SDG 7.2, the portions contributed by these three countries (barely exceeding 1% collectively) highlight the region's challenges with energy transition, particularly when contrasted with the metrics indicating global modern renewables. When it comes to SDG 7.3, the information points out that energy intensity in all three countries is increasing, which contrasts with the global trend, where the same indicator demonstrates a consistent decrease. Finally, figures related to SDG 9.4 point out that the CO₂ emissions per unit of GDP for Oman, UAE, and Saudi Arabia have shown different trends over time. While Oman and Saudi Arabia have experienced an increase, the UAE has remained constant throughout the analyzed period, except for a slight increase between 2008 and 2017. These trends contrast with global indicators, which demonstrate a decrease over the same period.

Based on the above analyses of the CE, S and TBL concepts and frameworks, a conclusion has been drawn that the concepts are often not fully understood which has led to misinterpretations, and/or lack of clear and well-defined strategies and policies. In the case of the three analyzed countries, the strategies and visions prioritize the environment (only one aspect of S) while social equity and economic resilience are often neglected in the context of sustainability paradigms. Even with regard to natural resources, measuring and reporting are not systematized. Occasionally, reporting on implementation has been found misleading. Having read several papers, this research paper hopes to have clarified these ambiguities and will be able to offer insights that bring benefits to the policymakers, industry and academic stakeholders. Hitherto, there have not been clear and definite policies on a macro level that would offer adequate direction. Fundamental tenets to be taken into consideration include: engaging all stakeholders such as clients, employees, local communities and society at large; financial sustainability; diversity and inclusion; cost efficiency; involvement in society; innovation and growth; ROI; employee well-being; long-term profitability; and ethical practices. Therefore, a new framework was developed and introduced in this study adding another, fundamental P to the existing TBL – the one that stands for Policies. This approach is based on the premise that economic development and prosperity are not a goal; economic viability should serve humanity. Consequently, a regenerative economy reaching sustainable development goals, and promoting healthy living conditions, is built.

Finally, the authors have found that the Gulf countries, albeit their willingness to move away from fossil fuels and towards renewable sources and sustainable goals, still need time to incorporate concrete goals into their strategy. They would highly benefit from establishing energy policies aimed at mitigating carbon emissions while preserving economic growth. Thus far, the three researched Gulf countries have not had a systematic approach and have not implemented measures that would make a significant sustainability impact. This means the 4Ps framework, once developed further (the approach must be clear and reflected in the policies, the measurable goals set, and the implementation systematically done with strict measures in place) and accepted by the policymakers, would benefit the Gulf region and help prioritize and systematize sustainable development activities in GCC area. It is recommended that future research deals with all the six countries in this region, and to try and obtain data that is currently unavailable with regards to SDGs.



Although an important step has been taken through this study, future research recommendation is related to the missing concept uncovered – the lack of focus on social and economic aspects and their relationship i.e. people and profit within the PPP framework is observed. Carefully analyzed, Oman, the UAE and Saudi Arabia, show continuous attempts to implement measures (as of recently) that would lead to more sustainable energy sources, although not without an abundance of challenges. Identified policy gaps and proposed changes will ideally promote sustainable business practices, incentivize circular economy initiatives, and create an enabling environment for people-centred and profitable circular models. Prioritizing a balance of social equity and economic sustainability is a holistic approach which can lead to more sustainable, profitable, ethical, and successful businesses in the long run and ultimately, improved local and global economy.

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NA PUTU KA ODRŽIVOSTI U GCC ZEMLJAMA: SPREMNOST ZA ENERGETSKU TRANZICIJU

Rezime:

Dok zainteresovane strane i kreatori politike u industriji i akademskoj zajednici sve više koriste termine *cirkularno* i *održivo*, termini nisu jasno shvaćeni. Štaviše, potrebu za prelaskom sa vladajućeg ekonomskog modela (linearnog) na cirkularni globalno su prepoznali glavni donosioci odluka. Prelazak sa jednog mehanizma na drugi predstavlja izazove u shvatanju principa cirkularne ekonomije (CE) i održivosti (S): njihovo definisanje, razumevanje sličnosti i razlika i njihova uspešna primena korišćenjem okvira trostrukog dna (TBL). Koristeći sistematski pregled literature, cilj rada je da razjasni nedoumice i doda razumevanje istražujući koncepte i odnos CE i S primenom sveobuhvatnog TBL okvira – koji uključuje socijalne, ekološke i ekonomske varijable. U literaturi se identifikuju nedostaci u pogledu odnosa prema ljudima i doprinosa profitu, a preporučuju se budući pravci istraživanja i novi okvir. Konačno, cilj je da se utvrdi da li je strateški pristup održivosti i mera na snazi u GCC zemljama - kao što je povećanje ulaganja u infrastrukturu za obnovljivu energiju koja bi mogla pozitivno uticati na spremnost za energetska tranziciju, o čemu svedoče indikatori energetske efikasnosti (smanjenje emisije ugljenika). U skladu sa ciljem rada, odabrane su tri zemlje GCC-a, njihovi ciljevi i izazovi su analizirani, i data je preporuka za dalja istraživanja.

Ključne reči:

cirkularna ekonomija,
održivost,
trostruki rezultat,
profit planete ljudi,
GCC