



# Un acercamiento al desarrollo local sostenible almociteño desde los métodos de pago alternativos: las monedas complementarias y las criptomonedas

An approach to sustainable local development in Almócita  
from alternative payment methods:  
complementary currencies and cryptocurrencies

Presentada por:  
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alternativos: las monedas complementarias y las criptomonedas

//

An approach to sustainable local development in Almócita from alternative payment methods:

complementary currencies and cryptocurrencies

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“The great growling engine of change - technology.”

*Alvin Toffler*





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...porque un texto que no va a ser leído, se encuentra marchito.

*Fco Javier García Corral*

# RESUMEN

El desarrollo económico que se ha seguido ha sobrepasado los límites regenerativos que tiene el planeta haciendo que surjan otros modelos, como la Economía Circular, que permita un nuevo planteamiento de crecimiento más sostenible. Gracias a este enfoque se va a permitir que municipios de pequeño tamaño, como es Almócita en la provincia de Almería, consigan combatir los fenómenos adversos que constantemente les están llegando debido a la complejidad de subsistir en un mundo globalizado.

Enfocado en ese desarrollo es donde entrarán en juego las Monedas Complementarias como una herramienta dinamizadora del mercado, pero con un objetivo social y medioambiental, que permitirán mantener de manera efectiva la eficiencia y fortalecer la resiliencia del sistema económico municipal.

Pero en ese mundo globalizado, las herramientas locales más clásicas pueden no ser las únicas que analizar, por lo que pueden renovarse a esas nuevas herramientas criptográficas potenciando la base que ya había para aprovechar las nuevas virtudes y generar una mejora en la calidad de vida de los habitantes.

Se está pidiendo que los municipios de interior se mantengan a nivel global, pues es posible que deban de barajar herramientas que surgieron dentro del contexto de este alcance para ello.

Esto nos deja como objetivo de la presente tesis doctoral el contribuir al ámbito de la investigación de la Economía Circular y las Monedas Complementarias y Criptomonedas para el fomento de un crecimiento más eficiente. Dicho ello, la contribución realizada al ámbito académico es amplia y múltiple, dividida en temáticas que se encuentran unidas por una misma sinergia, el desarrollo local sostenible. Se pretende así no solo mostrar como es posible un desarrollo enfocado en la circularidad que ayude a la supervivencia municipal, sino enseñar que disponemos de diversas herramientas, ya sean más clásicas o actuales, con un enfoque común orientadas en ello.

Así pues, la estructura de la tesis va a seguir un esquema de desarrollo cuyo orden de justificación comienza con un análisis local, para a continuación realizar un estudio social y de viabilidad en el entorno de estos métodos de pago alternativos, que finalizaría con un análisis bibliométrico sobre las criptomonedas como última versión de esas herramientas.

Por ende, la metodología seguida en los distintos artículos parte de una evolución del municipio almeriense en “The circular economy as an axis of agricultural and rural development: the case of the municipality of Almócita (Almería, Spain)” enfocada gracias a la metodología PESTEL y una sistematización de experiencias vinculando los proyectos realizados con los ODS. A posteriori, en “Complementary currencies: an analysis of the creation process based on sustainable local development principles”, se analiza la conceptualización de las Monedas Complementarias, junto a su posible puesta en marcha gracias a las metodologías PIN, Globo Volador, análisis DAFO y un Ranking de los Factores de Éxito. Sabiendo de su viabilidad o no, para concluir se enfoca el origen y significado de esta versión actualizada con “A bibliometric review of cryptocurrencies: how have they grown?”. En el texto se refleja desde un análisis bibliométrico de artículos científicos incluidos en las principales bases de datos de investigación, Web of Science y Scopus, la evolución del concepto de criptomoneda hasta las tendencias que pueden orientar el futuro de estos mecanismos.

Esto deja conseguido por tanto el objetivo planteado de ser conscientes del porvenir municipal enfocado en la Economía Circular, de saber si es viable o no, y de tener unas nociones más en profundidad sobre estas herramientas. Pero antes de finalizar y tras las conclusiones, al observar el amplio abanico abierto, se ha visto conveniente mostrar un preámbulo de la nueva línea de investigación comenzada: una síntesis normativa del concepto y sujeción (o no) a diversos tributos a nivel europeo para ver cómo se está enfocando una de las mayores problemáticas de esta novedosa herramienta, su intento de regulación.

Para llevar ello a cabo, la tesis se estructura en 5 capítulos independientes:

- Capítulo 1: Se resume brevemente la introducción a los conceptos que se abordarán, la justificación de la actividad investigadora, los antecedentes de la investigación, los objetivos, la hipótesis y la estructura seguida.
- Capítulo 2: se integran completamente las publicaciones originales que conforman la tesis por compendio: “The circular economy as an axis of agricultural and rural development: the case of the municipality of Almócita (Almería, Spain)”, “Complementary currencies: an analysis of the creation process based on sustainable local development principles” y “A bibliometric review of cryptocurrencies: how have they grown?”.

- Capítulo 3: se sintetiza un resumen y las conclusiones obtenidas de cada uno de los artículos científicos anteriores.
- Capítulo 4: se muestran unas conclusiones generales sobre las aportaciones más importantes de la tesis, así como las futuras líneas de investigación que se pueden seguir obtenidas de documento.
- Capítulo 5: como nuevas aportaciones no incluidas en la investigación central pero derivadas de ella, se muestra brevemente la actual línea de investigación con los resultados previos obtenidos, esta vez enfocada en el estudio normativo estatal y europeo de las monedas criptográficas.

## ABSTRACT

The economic development that has been followed has exceeded the regenerative limits that the planet has, causing other models to emerge, such as the Circular Economy, which allows a new approach to more sustainable growth. Thanks to this approach will allow small municipalities, such as Almócita in the province of Almería, to combat the adverse phenomena that are constantly reaching them due to the complexity of subsisting in a globalized world.

Focused on this development is where the Complementary Currencies will come into play as a market dynamizing tool, but with a social and environmental objective, which will effectively maintain the efficiency and strengthen the resilience of the municipal economic system. But in this globalized world, the most classic local tools may not be the only ones to analyze, so they can be renewed to these new cryptographic tools, enhancing the base that already existed to take advantage of the new virtues and generate an improvement in the quality of life of the inhabitants. Inland municipalities are being asked to stay at the global level, as they may have to shuffle tools that emerged within the context of this scope.

This leaves us with the objective of this doctoral thesis to contribute to the field of research on the Circular Economy and Complementary Currencies and Cryptocurrencies for the promotion of a more

efficient growth. That said, the contribution made to the academic field is broad and multiple, divided into themes that are united by the same synergy, sustainable local development. The aim is not only to show how a development focused on circularity can help municipal survival, but also to show that we have at our disposal a variety of tools, whether classical or current, with a common focus on the future.

Thus, the structure of the thesis will follow a development scheme whose order of justification begins with a local analysis, followed by a social and feasibility study in the environment of these alternative payment methods, which would end with a bibliometric analysis of cryptocurrencies as the latest version of these tools.

Therefore, the methodology followed in the different articles starts from an evolution of the municipality of Almería in "The circular economy as an axis of agricultural and rural development: the case of the municipality of Almócita (Almería, Spain)" focused thanks to the PESTEL methodology and a systematization of experiences linking the projects carried out with the ODS. Then, in "Complementary currencies: an analysis of the creation process based on sustainable local development principles", the conceptualization of Complementary Currencies is analyzed, together with their possible implementation thanks to the methodologies PIN, Flying Balloon, SWOT analysis and a Ranking of Success Factors. Knowing its viability or not, to conclude, the origin and meaning of this updated version is focused on "A bibliometric review of cryptocurrencies: how have they grown? The text reflects from a bibliometric analysis of scientific articles included in the main research databases, Web of Science and Scopus, the evolution of the concept of cryptocurrency to the trends that may guide the future of these mechanisms.

This leaves achieved therefore the objective of being aware of the municipal future focused on the Circular Economy, to know if it is viable or not, and to have more in-depth notions about these tools. But before finishing and after the conclusions, after observing the wide range open, it has been seen convenient to show a preamble of the new line of research started: a regulatory synthesis of the concept and subjection (or not) to various taxes at European level to see how it is approaching one of the biggest problems of this new tool, its attempt to regulate.

To do this, the thesis is structured in 5 independent chapters:

- Chapter 1: The introduction to the concepts to be addressed, the justification of the research activity, the background of the research, the objectives, the hypothesis and the structure followed are briefly summarized.
- Chapter 2: the original publications that make up the thesis are fully integrated by compendium: "The circular economy as an axis of agricultural and rural development: the case of the municipality of Almócita (Almería, Spain)", "Complementary currencies: an analysis of the creation process based on sustainable local development principles" and "A bibliometric review of cryptocurrencies: how have they grown?".
- Chapter 3: a summary and conclusions obtained from each of the previous scientific articles are synthesized.
- Chapter 4: general conclusions on the most important contributions of the thesis are shown, as well as the future lines of research that can be followed from the document.
- Chapter 5: as new contributions not included in the central research but derived from it, the current line of research is briefly shown with the previous results obtained, this time focused on the state and European regulatory study of cryptographic currencies.

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# CAPÍTULO 1. INTRODUCCIÓN

## 1.1. CONTEXTO CIENTÍFICO

El punto de partida es que cualquier acto que se realiza tiene una repercusión o consecuencia. Pero parece ser que, en virtud del desarrollo especialmente económico, se han ido priorizando unas repercusiones que no son las más adecuadas para la perpetuación a futuros puesto que se están sobrepasando los límites regenerativos que tiene el planeta (Varela, 2018). Esto ha hecho que las técnicas correctivas aplicadas en el pasado (Hueseman, 2004) hayan cambiado a otra visión menos lineal (Bocken et al., 2014). Así pues, por ejemplo, el sistema monetario en el que nos encontramos se ha venido desarrollando sin entrar a decir que, en múltiples sentidos, es inestable, y posiblemente necesite de un apoyo para mantener esa eficiencia y resiliencia (Lietaer et al., 2009).

Por consiguiente, en el sistema de desarrollo trazado en los últimos años ha empezado a coger fuerza un nuevo planteamiento de equilibrio más circular (Bocken y Short, 2016), que ha visto como el concepto de Economía Circular puede maximizar la eficiencia gracias a aportes de reutilización y regeneración (Yuan et al., 2008a; Chaves y Monzón, 2018). Esto va a permitir un progreso propio que mejore la calidad de vida a nivel económico, social y medioambiental (Vasquez, 1998).

En este contexto ya se puede decir que aparece la Economía Circular de manera oficial aportando otro enfoque de desarrollo que además protege el medioambiente (Mora y Martín, 2013). En su planteamiento, se pretende cambiar el concepto de vida útil por una extracción, reutilización, transformación, uso y recuperación más eficientes (Reike et al., 2018). Eficiente, por tanto, o la eficiencia, de manera generalizada, van a ser en todo momento las palabras eje de este modelo económico que han conseguido que mediante innovación, prospere el desarrollo productivo (Yuan et al. 2008b; Zhu et al. 2010; Xuan et al. 2011).

Pero en una escala más pequeña, a nivel local especialmente, el desarrollo se complica al ver como la competitividad en la que se encuentran enfrentados con las grandes urbes no les permiten entrar en esa etapa de prosperidad. Es aquí donde un nuevo enfoque económico les puede aportar ese factor diferenciador tan ansiado para su crecimiento mediante el uso de nuevos mecanismos innovadores (Melece, 2016).

Esos mecanismos que apoyen al desarrollo económico pueden haberse ya utilizado a nivel histórico y, simplemente, necesitar de una evolución a nivel estructural o funcional. Se trata de las monedas complementarias, definidas como aquella moneda que acompañan a las monedas de curso legal y como apoyo a mantener el sistema económico-financiero (Lietaer et al., 2009; Amato y Fantacci, 2020). Su uso responde a un movimiento social puesto en práctica centrado en las personas, que ayudará creando una red que aísla los factores externos negativos gracias a la flexibilidad y facilidad de adaptación que poseen estas herramientas (Gómez, 2008).

De ellas, han destacado o sonado más las comunes monedas sociales, junto a los sistemas de intercambio local, o LETS. Todas van a cumplir con las reiteradas funciones puestas de manifiesto por Paul R. Krugman y Robin Wells (2007) sobre el dinero, a saber, intercambio, unidad de cuenta y depósito o conservación del valor, pero con un nuevo fin. Ese objetivo es múltiple puesto que son los órganos sociales los que se encargan de establecerlo, haciendo a la moneda partícipe en la prosperidad de los territorios en los que se han aplicado (Seyfrang, 2001; Pacione, 2011; Brenes, 2013). Aunque como todo, no se encuentran exentas de riesgos (Lietaer, 1999; Kennedy y Lietaer, 2004), especialmente debido a que la libertad de fijación en el valor de la moneda y en sus creencias pueden hacer pensar que no cuentan con un aspecto impositivo, siendo este hecho falso, y por tanto haciendo necesario que se analice el uso y creación pormenorizadamente (Hayek, 1990; Peacock, 2014).

Aun así, se puede observar como el uso histórico de estas herramientas no parece añadir ahora ese factor de innovación que, como se ha dicho, precisaría para una correcta aplicación de un modelo económico nuevo más circular junto a una tecnología disruptiva. Aquí es donde la falta de clasificación y la libertad de actuación ha jugado un papel fundamental al mezclarse con estas nuevas técnicas, especialmente la blockchain, que podrían hacer de estas herramientas un bien social (Giménez e Ibáñez, 2019).

Desde finales del S. XX y con el auge que han sufrido este tipo de monedas, se ha intentado crear más de una tipología que realmente no se encuentra cerrada (Place y Bindewald, 2015). Las monedas han mutado en forma, tipo, espacio, uso, etc., y eso a nivel global. Ya un primer acercamiento muestra que en los últimos 15 años y, coincidiendo con las características de estas monedas complementarias, se había generado la moneda virtual criptográfica. Este desarrollo con Nakamoto (2008) como su diseñador de una moneda de uso global, ha hecho que instituciones como el Banco Central Europeo (2012) tengan que pasar a tomar parte y definirlas.

Este tipo de monedas son un medio de intercambio clásico, pero a su vez actualizado de manera digital, mejorando ampliamente los costes y agilizando los intercambios (Fang et al., 2022). Su irrupción de manera globalizada ha puesto tal vez demasiado el foco en ellas, no observándolas desde un ámbito local, pero haciendo que un concepto sea necesario puesto que la asimilación a otras tipologías (materia prima, moneda de curso legal, ...) está haciendo que participen con sus ventajas, pero también con unas amplias desventajas (Gomá, 2014).

Con ello se quiere llegar a decir que, el campo de las monedas complementarias es muy amplio, y es justamente esa apertura la que tasa que existan más de 15.000 activos en circulación. Únicamente en el ámbito virtual, estudios como el llevado a cabo por la web especialista Banklesstime (2022) habían concluido con la existencia de unas 10.397 tipologías en circulación online. Por tanto, y especialmente debido a esa multiplicidad de características que se le pueden acuñar en el momento de su creación, como son la circularidad y la sostenibilidad (Corrons, 2017), ¿por qué no utilizarlas y dinamizar el entorno?

## 1.2. JUSTIFICACIÓN DE LA INVESTIGACIÓN

En el presente apartado se debe diferenciar tanto la justificación actual de la necesidad de la tesis, como la motivación personal que ha llevado a su consecución durante este tiempo.

Primeramente y como principal causa corroboradora, se encuentra el amplio campo científico que no había venido despertando especial interés si se le compara con otras ramas del conocimiento. Las monedas complementarias han sido herramientas utilizadas en el desarrollo local, pero por nuestra zona, de una índole menor. Por tanto, ahora que el auge está empezando a verse gracias a la actualización que

ha sufrido su terminología al incorporar a las monedas virtuales, es necesario empezar a desarrollar más en profundidad como incidirían en un desarrollo local completamente sostenible según los Objetivos de Desarrollo Sostenible (ODS).

Se busca un progreso, pero de manera social, económica y medioambiental. Esa mejora debe poder materializarse en la vida de los habitantes especialmente luchando contra las detacciones ambientales que están acabando con el entorno. Y aquí, ese desarrollo sostenible será promovido desde la sociedad mediante el impulsado por las nuevas tecnologías de la información (França et al., 2020).

Esta causa es un llamamiento social que día a día se ve más presente. El cambio climático, las desigualdades sociales o la pérdida de identidad cultural no pueden ser un escollo del desarrollo. Se debe frenar el avance de estas (y otras muchas) carencias que se han ido viendo mediante el uso de alternativas que sean más sostenibles. Así pues, se debe partir de otro pensamiento, y es que no solamente se deben seguir las directrices propuestas por los poderes públicos, sino que los ciudadanos son también actores, y deben, respetando los límites establecidos, velar también por un crecimiento que no perjudique ni a los presentes, ni a generaciones futuras. Es decir, la sociedad como actor puede usar estas herramientas como iniciativas de innovación social que frene las dificultades económicas que están presentes en el mundo globalizado (Fahrudi, 2020).

Esto deja a las monedas complementarias, con las virtuales, un camino arduo que superar. Pero esa unión de planteamiento ascendente desde los ciudadanos junto a la vinculación de mantenimiento presente-futuro es la que puede abrir grandes puertas. Y para ello, se puede partir de que las monedas virtuales son nuevo panorama de emprendimiento e innovación atractivas para los grupos más jóvenes (Chen, 2018).

Junto a ello y como motivación personal, aunque sin distar mucho de los orígenes y lo ya propuesto anteriormente, la provincia almeriense posee una serie de recursos envidiables que deben protegerse. Como integrante del Proyecto “Marca Pueblo” llevado por el Grupo Almeriense de Economía Aplicada (SEJ-147) he podido comprobar y analizar personalmente la situación de diversos municipios provinciales mediante los correspondientes análisis estratégicos realizados y su diferenciación. Eso me ha encauzado

más en que el punto de partida es que la población se encuentra cada vez más focalizada en núcleos urbanos de costa, agotando ampliamente los recursos de esas zonas sin prestar atención al resto. Ya esas zonas se ven con obstáculos a la hora de desarrollarse, pero es que los municipios de interior no están en una mejor situación. Complicado es el desarrollo sostenible, pero más complicado es si se encuentran alejados de otros núcleos de mayor relevancia, dado que no pueden competir en muchos niveles con ellos y encima la obtención de recursos externos se dificulta por no parecer lugares atractivos. Son esos núcleos más pequeños los que además suelen localizarse en zonas ampliamente protegidas y, se busca que se desarrollem, pero bajo unas directrices estrictas: dificultades de adecuación urbanística a los planes de la comunidad autónoma por la complejidad de estas actuaciones debido a su menor tamaño, estado muy protección medioambientalmente de su entorno sin aportar alternativas para su crecimiento, amplios trámites burocráticos, etc.

Por ejemplo, se pretende que sigan prestando servicios clave medioambientales, pero a su vez no se observa si se les está permitiendo un desarrollo lógico o se les proponen simplemente alternativas como las Infraestructuras Verdes (García-Corral et al., 2022). Son municipios que luchan frente a la despoblación constantemente por no poder ofrecer todas las oportunidades que parece dar una capital provincial, pero se acotan para que le presten servicios a ella. Es decir, se está en una provincia muy pujante demográficamente que en el año 2021 quedó como la 5<sup>a</sup> con mayor crecimiento a nivel español, pero de ella únicamente 6 municipios son mayores a 20.000 habitantes, los siguientes 7 en población estarían entre 10.000 y 20.000 habitantes, a continuación habría otros 7 que se encuentran entre 10.000 y 5.000, etc. Esto realmente refleja que 67 municipios de los 103 tienen menos de 2.5000 habitantes (INE, 2022) y a esas circunscripciones parece que, en el mundo globalizado, les está costando desarrollarse.

### 1.3. ANTECEDENTES

Analizando el número de tesis doctorales cuyo foco sean estas herramientas alternativas de pago, se ve como el número es bastante reducido teniendo que indagar en distintas conceptualizaciones. Así pues, el término que más resultados ha dado es el de criptomoneda con un total de cinco resultados, estando completado únicamente con un resultado más de monedas complementarias y monedas virtuales. Este hecho enfatiza la falta de información que en muchos sentidos existe relativa a este tipo de mecanismos,

pero también la novedad con la que se han incorporado al mundo, haciendo que la indagación mediante de este tipo de trabajos sea más necesaria.

Primeramente, se debe mencionar el trabajo de Von Prittitz Und Gaffron (2017), enfocado en las monedas complementarias como un mecanismo de apoyo a la moneda legal. En la tesis se recoge una importante indagación sobre estos mecanismos de pago usados como instrumento de desarrollo local complementado con un análisis Delphi que recoge el impacto a nivel socioeconómico.

Por su parte y a continuación de una manera más técnica en el desarrollo de una moneda, Carrillo (2019), propone una actualización y el añadido de un nuevo paso, el protocolo de consenso denominado Prueba de Reputación (Proof of Reputation - PoR). En él, como híbrido de Proof of Work – PoW y Proof of Authority –PoA, se diseña este paso como un requisito de carácter básico para participar en la vida de una criptomoneda. Para ser un validador, se requerirá de una reputación. Esta mezcla va a conseguir mitigar diversos de los ataques y simplificar la validación a largo plazo. Es un esfuerzo que ejecutará el validador para confirmar que lo realizado está todo bajo unos criterios de exactitud y honestidad.

Seguidamente, Mendoza (2019) dictamina un modelo de comprobación de la aceptación de este tipo de herramientas por parte de los consumidores, así como una investigación práctica sobre como la participación conjunta y el uso de estas experiencias influencian la adopción de nuevas tecnologías y la confianza que se tienen en ellas.

Después se puede tratar sobre la extensa investigación llevada por Morales (2021) de las monedas virtuales. Él mismo recoge que serán un importante elemento en la administración sostenible gracias a la economía colaborativa y a la descentralización de las estructuras clásicas. Para ello, aborda el tema del emprendimiento y especialmente lo relativo a la innovación, para concluir diciendo que la tecnología blockchain y la sinergia que genera mediante el emprendimiento social pueden promover iniciativas de criptomonedas sociales como una nueva generación de apoyo financiero.

Además, está el desarrollo llevado por Nikolova (2021) que, por su parte, trata el tema de la evolución de las criptomonedas hasta la generación 3.0 pero especialmente enfocada en el mercado. La mayoría de

los estudios empíricos han seguido una línea rígida de volatilidad y ética, que no ha entrado a observar en detenimiento las características del mercado.

Para concluir, Jiménez (2021) ha trabajado sobre un sistema de evaluación de los riesgos, desde las técnicas de comprobación, hasta las medidas individuales.

#### 1.4. OBJETIVOS DE LA TESIS

El objetivo principal de la tesis consiste en analizar el desarrollo local y vincularlo con nuevas herramientas como las monedas virtuales, partiendo de un eje total de sostenibilidad. Con todo ello, se pretenderá desglosadamente:

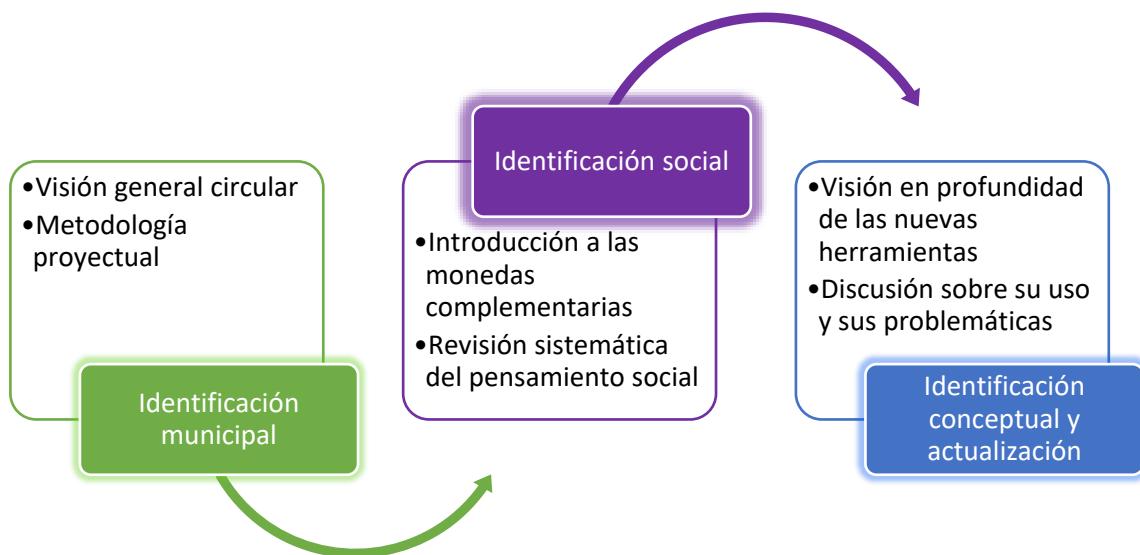
- I. Delimitar la importancia de la Economía Circular en el desarrollo sostenible, enfocado especialmente en el área. Se pretende orientar en un marco de actuación real sobre el que poder empezar a implantar nuevas hipótesis de monedas complementarias que puedan prosperar.
- II. Realizar un análisis de viabilidad principal, identificando ampliamente los sectores que influirán en la vida de esa herramienta.
- III. Creada una base sobre la que partir, se plantea delimitar los problemas en el entorno que le pudieran afectar, así como comprobar la capacidad de reacción que este tuviera.
- IV. Planteada la idea y observado el foco de actuación, se empezará a desglosar el concepto general sobre moneda virtual o criptomoneda que permita añadir una diferenciación innovadora con respecto a lo históricamente realizado. Es esa actualización generada mediante una serie de estudios derivados de sus palabras clave la que permitirá comprobar si se está dentro del ámbito correcto para establecer futuras tendencias de práctica y/o de elaboración teórica.

#### 1.5. HIPÓTESIS DE LA INVESTIGACIÓN Y SU PLANTEAMIENTO

La hipótesis con la que se planteó la tesis fue la de comprobar si hay cabida para estas herramientas innovadoras dentro del desarrollo local sostenible. Ello se pretendía abordar desde un enfoque múltiple partiendo del contexto económico, medioambiental y social. A tal efecto, se debía partir de un análisis municipal preciso que empiece a delimitar la posibilidad de incluir estas monedas independientemente

de su tipología y que, a continuación, permitiera emprender un estudio más encaminado en la actualización de estos instrumentos, Figura 1.

**Figura 1. Esquema hipótesis de la investigación**



Fuente: Elaboración propia.

Dicho esto, la presente investigación parte de un análisis general del municipio almeriense de Almócita.

Se mostrará el término a diversos niveles (político, económico, social, medioambiental, legislativo y tecnológico). Se deberá señalar el desarrollo mediante un enfoque económico circular así como la línea de proyectos que han estado realizando para focalizar si el objetivo planteado de herramienta de desarrollo sostenible tiene cabida en su territorio o puede llegar a verse en funcionamiento.

Tras este primer esbozo de la villa, se plantea por tanto la posibilidad de incluir dentro de su estrategia una moneda complementaria general, sin entrar en detalles sobre la tipología, comprobando la aceptación social. Se diseña el desarrollo desde la vertiente social para comprobar si los actores reales respondiesen de manera positiva ante este tipo de iniciativas.

Todo ello finaliza con una tercera etapa que efectúa una amplia revisión bibliográfica sobre el concepto de criptomoneda, aumentando especialmente en los horizontes de los problemas encontrados, para poder

encauzar la inseguridad que surge en el uso de estas herramientas. En esta línea se podría empezar a vislumbrar una forma para esa herramienta si fuera posible su creación.

## 1.6. UNIDAD Y ESTRUCTURA DEL TRABAJO

Como se recoge en la Normativa Oficial que regula los Estudios Oficiales de Doctorado de la Universidad de Almería, en su artículo 24, existe la posibilidad de presentar 2 modalidades de tesis doctoral:

- a) por compendio de publicaciones (Modalidad A)
- b) o mediante manuscrito avalado por publicaciones (Modalidad B)

La estructura escogida para el presente manuscrito corresponde a la Modalidad A, por compendio de publicaciones. Ella va a regir tanto las condiciones de las publicaciones propuestas como la estructura y forma del presente manuscrito.

El formato del manuscrito por tanto presenta tres artículos científicos evaluados y publicados en diversas revistas científicas que se encuentran indexadas en Journal Citation Report (JCR), Figura 2 (adjuntada al final del presente apartado). Para ello, los tres artículos se han elaborado en tres etapas completamente diferenciadas siguiendo un orden cronológico, en la que se ha delimitado y analizado el área de actuación en la provincia (Etapa 1 y 2) para, en un tercer periodo, empezar la conceptualización de esa herramienta si fuera posible llevarla a cabo.

Por tanto y como introducción a la investigación, durante las dos primeras etapas se llevó a cabo una revisión municipal mediante el artículo “The Circular Economy as an Axis of Agricultural and Rural Development: The Case of the Municipality of Almócita (Almería, Spain)” junto a una más en profundidad social con el texto “Complementary Currencies: An Analysis of the Creation Process Based on Sustainable Local Development Principles” gracias a la participación de la alcaldía y de los almociteños en el Proyecto “Marca Pueblo”. Para el primer caso, se partió de la base de la Economía Circular como pilar fundamental para el desarrollo local. Se puntualizó tanto la idea de Economía Circular, como una aproximación de lo que se ha ido realizando, aportando un análisis PESTEL municipal y una difusión de los proyectos que se han ido efectuando vinculándolos con los ODS. Esta aproximación ha permitido llegar a la conclusión de la posibilidad de, en un segundo paso, empezar a preguntar de una manera más social sobre la idea o no

de aplicar una moneda complementaria en su entorno. La evolución municipal sufrida en los últimos años generada especialmente por su espíritu de supervivencia ante la tan temida despoblación ha formado un sentimiento de subsistencia único que abre miras hacia el desarrollo utilizando las herramientas que mejor vean, desde lo más clásico (agricultura ecológica), hasta lo más moderno (indagar soluciones presentes como comunidades de proconsumo energético). Por tanto, el desarrollo mediante una herramienta actualizada como es una moneda complementaria enfocada en la virtualidad, parece que se puede materializar, especialmente cuando se observa que en ese segundo análisis es la gente la que no parece reacia a utilizar monedas complementarias, incluido el sector económico. A ello se suma una serie de entrevistas a los habitantes del municipio y a residentes temporales. Con esto se pretende mantener esa sostenibilidad idílica creada en el municipio, pero aportando una visión más actualizada a los nuevos tiempos en los que estos municipios se están viendo competir.

En último lugar y correspondiéndose con la Etapa 3, se presenta un análisis bibliométrico denso sobre las criptomonedas con un amplio desarrollo de la discusión y problemáticas mediante el artículo “A bibliometric review of cryptocurrencies: how have they grown?”. Puestos a actualizar una herramienta tan útil para el desarrollo social, se debe observar desde su conceptualización hasta sus virtudes y problemáticas. Para ello se efectuó un estudio en profundidad que fue desde las áreas de aplicación de estas criptomonedas, hasta los lugares donde más se ha publicado, entre otros, para terminar con un análisis de las palabras clave y tendencias. Visualizada la idea a la que se quiere llegar, se tiene que partir de los dilemas ante los que se encontraba inmersa esta herramienta para, a posteriori en futuras líneas, desglosar y comprobar si está bien enfocada.

**Figura 2. Estructura de los artículos que integran la tesis**

## FUTURAS LINEAS DE INDAGACIÓN Y PRESENTE INVESTIGACIÓN



Fuente: Elaboración propia.



## CAPÍTULO 2. PUBLICACIONES ORIGINALES QUE

### CONFORMAN LA TESIS DOCTORAL

#### 2.1. THE CIRCULAR ECONOMY AS AN AXIS OF AGRICULTURAL AND RURAL DEVELOPMENT: THE CASE OF THE MUNICIPALITY OF ALMÓCITA (ALMERÍA, SPAIN)

Francisco Javier García Corral; Rosa María Martínez Vázquez; Vázquez, Juan Milán García, Jaime de Pablo Valenciano (2022). The Circular Economy as an Axis of Agricultural and Rural Development: The Case of the Municipality of Almócita (Almería, Spain). *Agronomy* 2022, 12, 1553. <https://doi.org/10.3390/agronomy12071553>

INDICIOS DE CALIDAD		
Bases de datos	IMPACTO	CUARTIL
Journal Citation Reports (JCR) (2021)	3.949	Q1
Agronomy 18/90		
Plant Sciences 55/238		
Scimago Journal and Country Rank (SJR) (2021)	0,65	Q1

Categorías (SJR): Agronom and Crop Science

## Índice de impacto de la revista

CATEGORY

AGRONOMY

**18/90**

CATEGORY

PLANT SCIENCES

**55/238**

JCR YEAR	JIF	RANK	JIF QUARTILE	JIF PERCENTILE
2021	18/90	Q1	80.56	
2020	16/91	Q1	82.97	
2019	18/91	Q1	80.77	
2018	19/89	Q1	79.21	
2017	35/87	Q2	60.34	

JCR YEAR	JIF	RANK	JIF QUARTILE	JIF PERCENTILE
2021	55/238	Q1	77.10	
2020	57/235	Q1	75.96	
2019	65/234	Q2	72.44	
2018	78/228	Q2	66.01	
2017	112/223	Q3	50.00	

Fuente: Journal Citation Reports

## ÍNDICE DE CITAS

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Article

# The Circular Economy as an Axis of Agricultural and Rural Development: The Case of the Municipality of Almócita (Almería, Spain)

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**Abstract:** In recent years, the concept of the circular economy has been gaining relevance and its importance has grown both in academia and in rural municipalities in general. The rural development policy of the European Union, in addition to prioritizing the diversification of the productive activities of municipalities, encourages the adoption of the circular economy. The aim of this article is to show and publicize the applications relating to the circular economy that are being carried out in a rural mountain municipality with a small population focused on agriculture, and which are setting an example for others that are suffering the endemic problem of depopulation. A diagnosis is carried out taking into consideration local sustainable development methodologies. In relation to the results, the positive impact of these practices with a rural development approach based on awareness and education regarding the basic 3Rs (reduce, reuse, recycle) is highlighted. Almócita is an example that can be extrapolated to many mountain municipalities at national and international levels.

**Keywords:** Almócita; Spain; circular economy; rural development; rural municipality; agriculture; new technologies



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## 1. Introduction

The concept of sustainable development began to take shape at the end of the last century. It sought to satisfy the needs of present generations without compromising those of the future, combining economic, social, environmental and, more recently, temporal dimensions [1–7]. Through the application of sustainable development, the aim is to change the traditional system of resource extraction and subsequent processing as this is not considered sustainable, and in doing so to try to raise awareness and generate greater use of productive systems based on different practices that are more efficient, increasing the recovery and reuse of goods and services [8–16].

We are experiencing a further evolutionary change in humanity in which environmental problems must also become the focus of debate in socio-economic and political forums aiming to jeopardize the three pillars of sustainable development as little as possible [17–21], addressing problems not only with (end of pipe) corrective techniques [22]. This change is due to the failure of the linear economic system that emerged especially during the industrial revolution [23], which did not contemplate a general awareness of production and environmental care at either a business or a governmental level [21].

It is clearly observed how in all environments, including the smallest ones, the posited linear economic model of extract, produce and consume is incompatible with the system of limited resources that produces enormous consumption and waste [24], and which has affected the balance of burden and regeneration limits [25–27]. Therefore, more practical

measures must be implemented that will complement government regulations to generate economic, environmental and social growth [28].

One such environment is agriculture, a basic pillar of society. Food production is fundamental and represents one of the sectors with the most transformative impact on the environment, urgently requiring a less linear, more circular model as a necessary strategy for the achievement of sustainable and regenerative agriculture [29,30]. Thus, recycling and reuse are beginning to be seen as key roles in agriculture. This can be achieved through measures such as using one's own waste for fertiliser, improving water efficiency and upgrading the type of irrigation, and even transforming waste into other packaging mechanisms. It is therefore clear how agriculture and sustainability can be merged through other economic principles that offer new solutions [31].

At this point, it is clear how the evolution of the classic linear model makes it necessary to seek other systems which have a circular approach in order to pursue economic prosperity and environmental protection, within the sustainable development model that begins by underlining the stability of “reduce, reuse and recycle” [21,32]. It is from this point that the circular economy, hereafter CE, appears and begins to slowly gain importance. It endeavours to achieve local sustainable development through a new economic system that aims to contribute to reducing the environmental impact caused by development processes and improve productive efficiency and well-being for all [33–38]. However, for this development to come into effect in the most satisfactory way, it must take place within an endogenous process of the territories themselves delimited by their political-administrative structure [39] including a greater territorial linkage [40].

The strategies followed by CE, usually of sustainable design such as Cradle to Cradle, will be important because they help to reintroduce products as resources [41,42], and they will have different levels of influence from micro, to meso and macro [23]. In the case of CE, they are brought together within the so-called 3Rs (reduce, reuse, recycle), or the 9Rs in their extended version (reject, rethink, reduce, reuse, repair, renew, remanufacture, recycle and recover) [43].

CE is based on the principles of diversity, resilience and comprehensive thinking, which requires an integrative approach to biological and technological material cycles, promoting a cyclical relationship and flow of extraction, transformation, distribution, utilisation and recovery of available materials [37,44,45]. However, it should be noted that there is no perfect and closed system that allows every action to be carried out, making it clear that there are both advantages and limits to their application, Table 1 [46–57]. In other words, CC is not always positive, but also needs to overcome a number of problems, including political regulation and economic incentives for implementation, technical barriers and self-interest in environmental issues, or neglect or non-inclusion of many social dimension factors [58–64].

Therefore, and given the context of the circular economy and its implications in sectors such as agriculture, the general objective of this work is to analyse the circular economy from the point of view of a rural municipality with an important agricultural base. This research can be extrapolated to other rural mountain municipalities with which it shares characteristics or that simply need to observe a model and thus can be of particular interest to public administrations, politicians, the private sector, researchers and experts in local development, the circular economy and other related areas.

**Table 1.** Advantages and limitations of CC.

Advantages	Limitations
There are more resources through improved security, reduced dependence on other distant entities and the use of more local products.	There are thermodynamic limits in cyclic systems such as resources, waste and emissions which are also co-localised.
The environmental impact is improved as everything is more localised.	The product generated in this environment can produce problems in its development and use that will have repercussions everywhere regardless of sustainability issues.
Economic benefits are generated by creating new opportunities for economic development, especially through innovation, together with the possibility of updating business policy internally and externally.	The planning of the way forward is complex as it has to take into account multiple variables that have been so far overlooked and there is no common regulatory framework. At the same time, there are limits to governance and management, as well as to the strategies to be followed. In this setting, we can even see confrontation between actors, or “sectarianism” may be fostered, ignoring international safety agreements and resorting to abusive production models.
An overall social improvement is fostered by promoting more sustainable behaviour for consumers, along with an increase in local labour, an increase in creativity and a better understanding of the processes of pollution, recycling and reuse.	There are technological barriers that cannot always be overcome and may even require prior research, hindering programming schedules. In turn, the technology available will not always be the most efficient but will take into account its position in the market.
	This improvement in efficiency during development or in consumption will not necessarily be adopted, producing maintenance of the current culture or even a greater rejection of change. The actions carried out will be analysed and cultural/social barriers will begin to crop up. In other words, it is possible that cultural or social norms may also require an evolution that will emerge over time.

Source: Own elaboration.

This leaves us with the specific objective of trying to visualize a municipality that follows the principles of the circular economy correctly. To do so, both the municipality in general and the projects being developed should be shown. Thanks to the PESTEL analysis methodologies and the systematization of experiences, it will be possible to frame both the municipal orientations and the local development that have arisen from these to show this circular model.

Regarding the municipal selection, the municipality of Almócita in the province of Almería, Spain, has been chosen, linking all the projects that are being developed with the principles of the circular economy and the sustainable development goals. The municipal selection has been made according to several criteria.

Firstly, it has been based on the agricultural base as the origin, making it necessary for the livelihood of its residents. This has been the main focus of sustainable actions, including the implementation of or participation in projects linked to agroecology in particular. Secondly, and as a direct consequence, the municipality has positioned itself in a good position on the scale. This has allowed it to win the national CONAMA award for sustainability of small- and medium-sized municipalities, thanks to its commitment to agroecology, culture and democracy. Additionally at the regional level, has been awarded by the Ministry of Environment and Regional Planning and the Andalusian Federation of Municipalities and Provinces with the first prize in the VII Contest of Good Practices of En-

vironmental Education and Urban Sustainability in Andalusia for its project “Ecomuseum and agroecology to combat rural depopulation”. Finally, and although on a smaller scale, it has also been awarded by the 2018 Atila provincial awards with the “Good Grass” prize thanks to the commitment to energy transition policies, promotion of ecological agriculture and the great participation in bio-construction. In turn, and with respect to the divulgation level, it collaborates with the Spanish Society of Ecological Agriculture and Red TERRAE making publications on the path they follow. To conclude, it should be noted that it has been placed as one of the first as a reference thanks to the recent Photovoltaic Energy Community, being the second Spanish municipality to create it, but a pioneer in Europe thanks to the intelligent system of implementation. Specifically, the Local Energy Community (CEL) is an efficient and democratic solution that is shaping a shared self-consumption and that, through blockchain technology, allows the co-marketing of renewable energy between peers (P2P). The energy generated can be sold through the blockchain-enabled xGrid platform, allowing, for example, its purchase by neighbours who lack the facilities.

Therefore, thanks to the identification and more in-depth entry of their actions, it will be possible to break down those good practices carried out by municipal authorities and their neighbours. This can mark a fixed line of research that can be observed by the rest of the municipalities and the research community. The underlying justification is based on the observation that municipalities as a public political entity are a key unit in the management of circular economy ideas in all their ramifications, such as the efficiency of waste management and collection [65].

## 2. Materials and Methods

### 2.1. Initial Considerations

The structure of the work and the intended approach of the article correspond to a constructive process in five consecutive systematic phases. The first three phases lasted six months. Once the theoretical framework was in place, the hypothesis was set and the site was selected, the observation and monitoring of the municipal actions were carried out over a twenty-four-month period from non-November 2019 to November 2021. This left phases four and five complete. Subsequently, the conclusions and the analysis of their possible re-applicability were established for a period of four months. The systematically applied phases are as follows:

1. The current situation of the circular economy was highlighted in the introductory part, focusing especially on its advantages and disadvantages. During this preliminary phase, which lasted for half a year, a basis on the circular economy and the concept of the municipality was created.
2. A problem or dilemma was then defined. In this case, the correct application of the circular economy in a controlled and analyzable environment.
3. A research hypothesis was then established, as follows:
  - a. Is there a municipality that correctly follows the guidelines of the circular economy?
  - b. If the statement is correct, are the references provided and the projects re-implemented relevant to local development and its maintenance?
4. This made it necessary to outline an introductory framework of the municipality to facilitate a better understanding of the topic. To do this, a population analysis was carried out to show its evolution and to be able to choose the trigger of this new strategy, allowing to better delimit the correct period to analyze. Then a more in-depth investigation was carried out after that date, being the last economic crisis of 2008, which ended up materializing this change of municipal idea. Finally, and in a more current period, we observed the approach of the most recent projects already elaborated or future, thanks to a follow-up in the municipality itself between the years 2019 and 2021.

5. After that, the corresponding analyses were carried out to report on the mechanisms or projects carried out, as well as their assessment, especially observing those of an agricultural nature which were the first to be carried out.
6. Subsequently, conclusions were drawn on the site and considering the scope of the applicability of the solution to other locations.

## 2.2. PESTEL Analysis

A more exhaustive check will be carried out for a short recent time period corresponding to the years after the 2008 crisis and up to the present day. This will be achieved by applying a PESTEL matrix encompassing the municipal context. PESTEL analysis is often used from a business perspective to plan future strategic directions based on the environment. Therefore, it allows to observe and evaluate the impact that such an industry would offer [66]. In turn, it is a multifaceted analysis that allows for capturing strategic forces and supporting decision making [67].

The PESTEL matrix indicates the conditions of the macro-environment in which the municipality of Almócita is located. The term was coined by Harvard Business School professor Francis J. Aguilar in his book “Scanning the Business Environment” [68]. The matrix to be filled in corresponds to the elements in Table 2.

**Table 2.** Elements of PESTEL.

Politics	Economy	Social
Aspects concerning existing or potential government, international relations, governmental stability, etc.	Micro and macroeconomic indicators such as level of output, interest rate, level of employment, etc.	Factors such as trends and fashions, demographics, culture, religion, purchasing power, etc.
Technology	Ecology	Law
Aspects such as the state of technology, access to technology, potential for innovation, etc.	State of the environment, ability to achieve sustainability, etc.	This encompasses everything relating to the legislative situation corresponding to the sector under study. Due to the scope of the case, as it is a municipality, the most relevant regulations relating to its latest projects will be shown.

Source: Own elaboration.

On a scientific level, this methodology has been used in a variety of areas to define the characteristics of the external environment [69]. In the field of the circular economy, the analysis of challenges and trends in the circular economy [70] and the study of the environmental performance of island areas [71] stand out among the extant research works.

## 2.3. Systematisation of Experiences

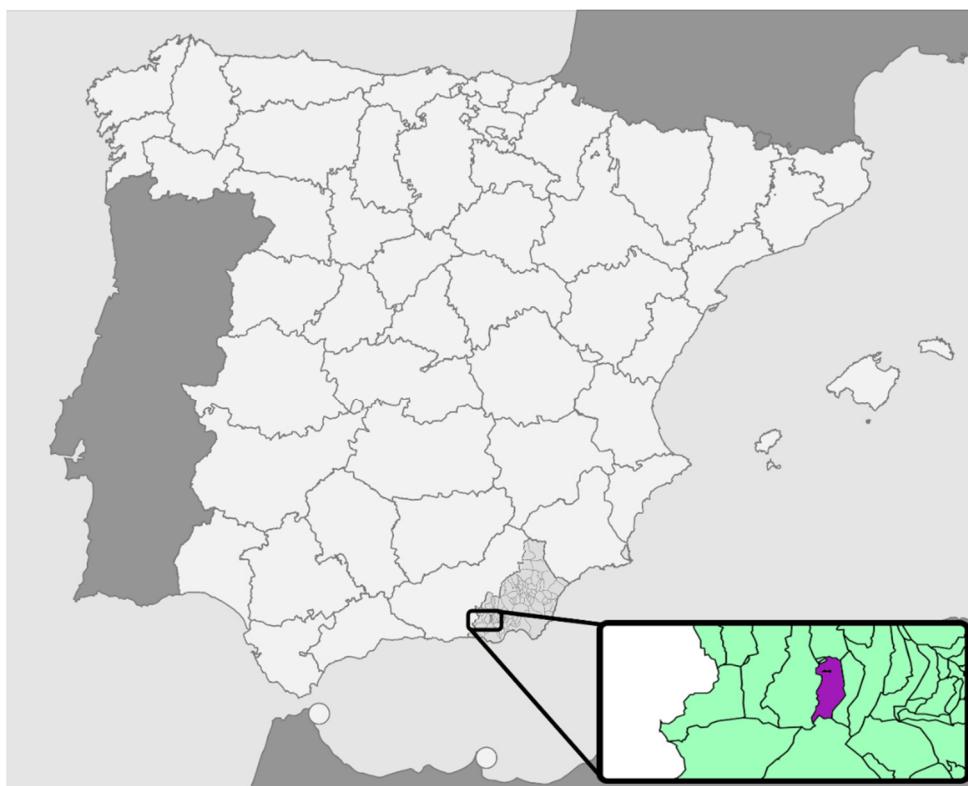
Following the diagnostic matrices of the situation and using the same time period, the methodology of systematisation of experiences was applied. According to Jara Holliday, this methodology is defined as “the critical interpretation of one or several experiences which, by ordering and reconstructing them, uncovers or makes explicit the logic of the process experienced in them”.

The main characteristic of this methodology is the dialogue between the main actors and the way they act out the reality. It seeks to preserve local information, to improve the implementation of plans, to verify self-management and sustainable development, and to strengthen popular empowerment and organisational capacity by promoting local cooperation.

This methodology is not a mere description of the project but delves deeper, allowing experiences from previous projects to be examined and to use the lessons learned in order to improve the implementation of a current approach [72].

### 3. Contextualisation of Almócita

The municipality of Almócita is located in the Alpujarra Almeriense region with a surface area of 30.8 km<sup>2</sup> [73]. Its municipal area is located between Sierra Nevada and Sierra de Gádor and belongs to the Sierra Nevada National Park (Figure 1).



**Figure 1.** Location of the municipality of Almócita (Spain). Source: Own elaboration.

Almócita has 197 inhabitants, being one of the 10 municipalities with the smallest population in the province [73]. Indeed, its population fell by more than half during the last century [74]. It is located at a distance of approximately 47 km from the capital [73] and has a classic Arabic urban structure made up of simple, white houses located in small, sloping, winding streets. The town is essentially agricultural with grapes having been the key crops for centuries.

Focusing on its population, the average age of the municipality is 49.4 years [73]. 71.1% of the population is of working age, with the dependent population making up 28.9% of the total, of which 19.3% are over 65 years of age [75]. This is a high rate of ageing, which is forecast to be even higher in the coming years.

With regard to the economic context, the municipality has been based on a poorly diversified economy, principally family farming on a subsistence scale. In recent years, the most important crops have been green beans (2 hectares) along with olive groves and almond trees as the main irrigated and unirrigated woody crops, with 53 and 60 hectares, respectively [76]. In terms of other economic activities, most are carried out by self-employed workers [76]. Finally, and in terms of tourism, the municipality has considerable potential for cultural, sporting and spiritual tourism, but no strategic promotion has yet been established.

The town council is working hard to prevent depopulation and to encourage new inhabitants to settle in the municipality. The actions carried out in the past and proposed by the town council for the future are underscored by the circular economy. These actions began mainly with the local economic engine, which is agriculture, and new inhabitants were attracted thanks to the fundamental role of the town hall as the land facilitator and its role as an intermediary, creating a relationship of trust while also acting as a disseminator

of knowledge. This line of action of the town council intensified after the economic crisis of 2008, carrying out work to update social thinking, in meetings, workshops or fairs, in order to achieve local economic reactivation based on the circular economy. It is committed to agroecology, culture and participatory democracy, recently putting the so-called “Almócita in Transition” plan into action, with the proposal of several projects all focused along these economic lines [77].

More specifically, the environment that defines the municipality of Almócita in the context of the circular economy in the agricultural sector is reflected in the following PESTEL analysis.

### 3.1. Politics

On a general level, elections to the Congress of Deputies and the Senate were held in November 2019, and the 14th Legislature began with the publication of the composition of the first government in the Official State Gazette on 13 January 2020. Within the municipality, there is currently a stable government that has been in power since 2011 with no foreseeable changes. It maintains a broad relationship with neighbouring municipalities without the existence of major external conflicts.

The emergence of the COVID-19 pandemic caused the WHO to declare a worldwide state of health emergency and this has had severe repercussions in the municipality.

Active participation in numerous events related to depopulation.

Green and digital transition as key factors in the agreement on the Recovery Plan.

Equality policies between women and men and the promotion of R&D in rural areas are noted.

### 3.2. Economy

The main economic activity is agriculture, although there are other economic activities in the area.

The establishments with economic activity during 2020 consist of: 8 without employees and 1 with up to 5 employees.

The hotel and catering industry is the activity with the most business premises with a total of 3, followed by commerce. Even so, the weakest sectors at present are those related to the catering industry, since external income is scarce except during the summer season and these establishments remain closed for several days a week.

The local economy has stagnated further due to the pandemic, although there was already a low level of diversity in the labour market.

There is a municipal unemployment rate of 16.2%.

Neither this municipality nor its nearest neighbours have an industrial estate or connected area with good communications.

There has been a temporary repopulation through teleworking which, to a certain extent, has attracted people to the municipality.

The budget of the local authorities has remained stable.

The average net income declared during 2019 did not reach the Minimum Interprofessional Wage, leaving the average purchasing power of the municipality rather low.

Over the last few years, several job vacancies and temporary employment opportunities have arisen, making the town council the “company” with the greatest impact on the territory.

Tenders have been invited for the leasing of several municipal warehouses in order to stimulate the local economy irrespective of their location.

There is a cash dispenser and this is the only way to carry out non-online banking transactions in the area.

There is no large parcel collection point in the municipality or nearby.

### 3.3. Social

The population is aged although it is not the highest average in the area.

The sense of belonging to the municipality is weakening due to the repopulation with newcomers who are motivated by the cultural orientation of the latest interventions. This means that ecological thinking about the area is becoming increasingly present in the municipality itself. Nevertheless, there is a wide cultural division in the municipality that has generated an increase in social scepticism about certain initiatives carried out.

Customs and traditions have been supported even during the pandemic through online competitions.

There has been an increased appreciation of handmade craft products or crops that have not been grown on large farms. Thus, even mutual cooperation initiatives among the members of the municipality are encouraged, regardless of whether they involve new settlers or not.

Generally speaking, interest in sustainable rural tourism has grown and is seen to be complementary to sun and beach tourism.

There is no place nearby for nightlife, thus foregoing potential income and making the location less attractive, especially for younger people.

#### 3.4. Technology

The municipality has a fibre optic connection throughout the town and has held digital literacy seminars.

It also has a good 4G connection, although there are no plans to upgrade to the 5G network.

The Guadalinfo Centre is available for various activities.

#### 3.5. Ecology

The local population maintains responsible consumption because they are aware that human intervention in a given ecosystem must be kept to a minimum in order for that ecosystem to survive over time.

The environmental debate has not been ignored and is mentioned specifically in every municipal meeting.

There are recycling containers throughout the municipality, a charging point for electric vehicles, a composting area, ...

Part of the project for the installation of solar panels has been carried out in various municipal and private premises to achieve energy self-sufficiency in some areas.

There is neglect towards part of the environment by the inhabitants because certain aspects are not seen as profitable or because they fall outside the planned projects.

Scarcity of water resources.

Implementation of the circular economy in the municipality with different aspects. Great environmental and landscape wealth.

#### 3.6. Law

Based on the self-employed and SMEs due to the size of the Almócita nucleus, the central core is governed by the Corporate Tax (Law 27/2014 of 27 November on Corporate Tax).

Development and implementation of a legal framework regulating the conditions of teleworking.

A search for alerts for legislative publications (BOJA, BOE, DOUE, etc.) is proposed. General Urban Development Plan is to be carried out.

The current configuration of the Social Economy is governed by Law 5/2011 of 29 March and the III Andalusian Pact for the Social Economy.

## 4. Results

Below is a summary of the pre-2020 actions being carried out in the municipality that link agriculture with the principles of the circular economy (Table 3).

**Table 3.** Initiatives implemented prior to 2020.

Title of the Project	Summary	Circular Economy Principles Applied	SDG
Land Bank	This belongs to the TERRAE Network of Agro-ecological Reserve Territories. Within this framework, there is a land bank that assigns a value to all the plots that were unused so that new neighbours can work them. The land was made available free of charge to agroecology project holders.	Reduction Reuse	2 10 12
Talks, workshops, municipal events and ecomarkets: Ecomeetings, Agroecology Workshops, Agricultural Conferences, Candles Night (Night of the Oil Lamps)	Among all the activities that are carried out as part of the various public events of the municipality, the Ecoencuentro stands out within the framework of the Project Promoting Sustainable Food Systems in Andalusia through local crop varieties. In this event, activities such as seed tasting and exchanges, collaborative work days, talks on the situation of nearby crops, development of short trade circles, etc., can be carried out. So-called ecological education is promoted within the municipality, seeking food sovereignty that goes beyond the agrarian vision at a productive level. For example, the course "Food Sovereignty in the face of Climate Change: Edible Gardens" was recently held. In a practical way, it contributes to the visualisation of agriculture in a way that is closer to society through workshops aimed especially at children.	Dissemination/Rethinking Reuse Recycling Reduction Recovery	17
Vegetable garden and neighbourhood chicken coop	The "Grandfather Emiliiano" farm was created as a community project. Several people from the municipality have laid out a wide terrace for the production of vegetables and fruit. Responsibility for maintenance is shared among them. To prevent pests and diseases, the garden has a series of insecticidal plants around it, along with other materials such as a macerate of garlic, rue and wormwood. Fertilisers are also made on the farm. In the henhouse, the workload distribution is organised on a weekly basis, with each family in turn taking care of the care and collection of the chickens. Next to the henhouse, there is a compost bin in which all the organic matter is deposited.	Reuse Reduction	2 10 12 13
Production-Project "Ecological Mushrooms".	A smaller-scale mushroom cultivation project has been carried out on poplar logs collected from private farms as this is a fast-growing species.	Reduction	10
Seed bank and use of local seeds	Classified as a place where seeds are stored in the short term for agriculture or in the long term for conservation. The idea is to rescue, plant and store indigenous seeds. With this initiative support is provided to local people who are interested in extracting their own seeds after harvesting.	Reuse Recovery	13 15
Compost Centre: Your waste creates life	It is intended that in the future, complete recycling of the organic waste can be carried out achieving zero kilometres and avoiding transport. In the first year, the aim is to recycle approximately 20 tonnes of this waste. All the compost generated will be used as fertiliser for the vegetable gardens and green spaces. This more modern project goes hand in hand with the composting facility, which has turned over about 3 tonnes in the past year.	Reuse Recycling Reduction	11 13 15
Development of the edible arboretum area	Through the Savia Foundation, an area has been set up with various fruit trees planted by the youngest children in an effort to link them to their land and generate greater future involvement.	Recovery	11
Participation in various competitions, seminars, ...	For example, the municipality took part in the 1st Ecochef culinary competition of the TERRAE Network with 5 entries of original and traditional dishes made with local seeds.	Dissemination/Rethinking Reuse Recycling Reduction Recovery	12
Development of a monthly open forum	The municipality is supported by a strong participatory democracy. Therefore, a forum is regularly held for all citizens to discuss and propose actions to be taken within the municipality.	Dissemination	11
Promoting bio-construction: Municipal dome	An ecological multi-purpose building made of straw, wood, lime, sand and water has been created. They are currently thinking of exporting this type of construction to other buildings.	Recycling Reuse	11 13
Communal oven	A communal oven in a room of 8X3X3m built with adobe bricks handmade by the villagers and members of the consumer group Trotahuertos.	Reduction	11 12
Organic egg farm	Although privately owned, they have managed to foster an entrepreneurial spirit and have created an organic egg company which now also sells a range of products such as olive oil. The 3rd generation of the original family forms the basis of the farm, although the location has changed. They have 850 m <sup>2</sup> of outdoor areas and a factory, as well as 1,350 free-range laying hens and 3 hectares of olive trees.	Reduction	2 8 12

Source: Own elaboration.

Along with other complementary actions in the search to achieve a circular economy, the “Almócita in Transition” programme has been launched (Table 4).

**Table 4.** Projects to be implemented from 2020 onwards with the “Almócita in Transition” programme.

Title of the Project	Summary	Circular Economy Principles Applied	SDG
Energy self-sufficiency, pro-consumer community and elimination of wiring on facades	<p>The creation of a Pro-Energy Consumption community is proposed, which will start with the installation of municipal renewable energies while establishing agreements with the neighbours for the installation of photovoltaic panels on the roofs of the houses, together with the installation of batteries for energy storage. The aim is that, as a community, they will be both energy producers and consumers.</p> <p>A secondary objective is the burying of all electrical wiring and current cabling necessary for the panels and batteries. The creation of an energy bank is also contemplated to supply people who are at risk of social exclusion or whose income does not reach the minimum threshold.</p> <p>Implementation has already begun. There are more than 100 solar panels located in parts of the municipality such as in a restaurant or on some municipal facilities. In order to lend greater emphasis to the project, a cooperative has been set up and its statutes are currently being drawn up. Its provisional name is “Comunidad Energética Eco Almócita Sociedad Cooperativa”. The 100 solar panels currently generate a surplus of 50KW.</p>		7 8 10 Reduction 11 12 15 17
Self-managed cohousing	<p>The project proposes the creation of a community self-managed by the inhabitants. It would be made up of small dwellings for small families grouped to live together and share common spaces. In principle, a series of 30 flats are proposed for a maximum of 60 people who, in turn, can help each other by undertaking the management of the community.</p>		10 Reuse 11 17
Municipal eco-housing for rent	<p>As a complement to the previous case, the transfer of efficiently sustainable housing is considered once the current market is updated.</p>	Recovery	10 11 15 17
Green smart multi-service buildings for the settlement of local entrepreneurs in rural areas	<p>The construction or adaptation of buildings to house entrepreneurs in order to facilitate their work or, if required, to inhabit.</p>	Recovery	8 9 11 17
Mobility and sustainable tourism plan	<p>The municipality is committed to sustainable urban planning, developing processes towards local rural sustainability through the implementation of basic tools and infrastructures that allow the conservation of cultural and natural heritage while improving the quality of life. A start has been made with the planning of car parks to justify the pedestrianisation of the town centre; the creation of a network of electric bicycles for local and tourist use; and the necessary technical support for the implementation of a General Mobility Plan.</p>	Recovery	8 11

**Table 4.** Cont.

Title of the Project	Summary	Circular Economy Principles Applied	SDG
Ecological forest project	It is proposed to combat desertification by regenerating the autochthonous Mediterranean forest while creating from this “new” resource a future sustainable routemap, generating stable employment in sustainable forestry exploitation.	Reuse	8 9
	The forestry sector routemap contemplates the establishment of didactic routes, artistic spaces, a nursery area and research areas, all of this when required, conserving the traditional Alpujarra architecture and the dry stone work declared a World Heritage Site by UNESCO.		11 13 15
Zero organic waste	The Zero Organic Waste project is aimed at the independent and selective collection of all organic waste discarded from municipal households and agricultural, gardening and forest pruning waste from the municipality. The goal is to obtain compost to enrich agricultural soil, favouring a circular process of collaboration and environmental awareness through a strategy of Just and Inclusive Transition.	Recycling Reduction Reuse	11 12 13 15

Source: Own elaboration.

## 5. Discussion: A Shift towards a Circular Economy

The evolution from a linear economy to a circular economy requires coordination between public administrations, economic sectors and society. In the circular economy model, products are part of an integrated distribution channelled towards the distribution of a service, the geographical location of which influences their production and use. Business model innovation is not limited to simply changing the product or service offered or the way it is produced but focuses on how and for what it is produced, with a view toward social and environmental benefits. Therefore everything is conducted at a more local level, which may even mean changing the terminology from “business” to “economic activity” when discussing it.

The principles of the circular economy can be applied to the functioning of the production system in the agricultural and livestock sector [78]. Within this approach, there are studies that analyze the impact of technology on the productive process, although it is necessary to be attentive to the different realities as can be seen from the classification of Mühl and Oliveira [79] and it is clear that investment in agricultural ecological capital plays an important role in promoting the development of the circular economy in general, but it is necessary to observe both active and passive investment because their impacts are different [80]; others show the effect of entrepreneurship-oriented education making it clear that there is a lack of in-depth work in less common thematic areas [81] or the increase of productive efficiency under the circular model thanks to techniques such as the reuse of waste on farms for composting in a satisfactory way as can be seen from the “Vermi Ekoprodukt” Farm [82] also emphasizing the need to create new distribution networks or strengthen the existing ones [83].

Efficiency is the intrinsic dimension of greatest strength in the body of CC. Therefore, the application of this type of economy has been mainly in ecological areas or in areas such as the municipality of Almócita, with construction and agricultural activities being particularly relevant.

Even so, we must take into account and learn from various experiences in production processes in countries such as China or Japan that have promoted technological innovation in the materials used or even the consumption of the main goods has changed with very positive results, showing how a global approach is necessary in which everyone takes

part [32,84,85]. Thus, the circular economy model can be applied as a development tool in many fields, as can the approach in the Erhai Lake basin, with a unique industrial structure with several weaknesses in which it is seen how an agro-circular system should be applied that treats energy, ecological breeding and integrated waste utilization model for proper maintenance [86].

However, not everything is positive, since at the local level and as we go down the scale, the deficiencies of the areas are more marked, revealing economic deficiencies such as the scarce generation of companies and their low specialisation, low production that does not add value, lack of coordination in environmental management, or the lack of technical-technological know-how. This is also mainly due to socio-cultural factors such as apathy and lack of citizen participation together with a lack of association and low local articulation [87]. Therefore, the current framework such as the one suffered by the municipality with the lack of diversified projects seems to further aggravate the competitive disadvantages of these rural mountain municipalities, despite having other great advantages. It is, therefore, necessary to establish a geographical differentiation and to elaborate an exhaustive analysis when presenting circular economy proposals in order to clearly identify the starting point, as has been performed in the research on the renewal of Italian municipal waste systems [88] or the collection system of Polish rural and urban municipalities [89], which show how localization is a factor to be taken into account in the elaboration of these projects if we are looking for efficiency.

In order to achieve change, it may be necessary to resort to and take advantage of: submission to comply with new guidelines and legal frameworks either top-down from institutions or bottom-up from the socio-economic actors themselves; or willingness to gain benefits or advantages irrespective of the area [90]. These are benefits for economies as a whole, for the consumer and for the business sector [9,91]. Therefore, a first step to overcoming the aforementioned barriers would be the creation of a policy to foster regulatory, economic and market instruments, volunteers, knowledge, supply and finance. These policies will need to go further and will require changes in the functioning and proposals of the institutions themselves, rendering the discourse and actions more useful, as there is a large gap between the policy statements on needs and the current reality [92].

Currently and in the face of this situation, it is worth mentioning that due to the global pandemic created by COVID-19, the economies of countries can benefit from the circular economy to pursue their development thanks to the establishment of public policies based on the Rs along the entire product chain, so as to take advantage of the productive negativity experienced as a nexus of change and improvement. However, it should not be reduced to the most classic projects, as most initiatives are clearly focused on reduction and reuse, advocating the simplest of things, such as recycling as a recovery goal. One should only avoid these generalities by identifying projects of several of the proposed Rs such as those carried out in the municipality under analysis, since, if an area is merely proud of its high recycling percentage, it is possibly not applying the circular economy in the right way [93]. For example, the city of Dalian started with projects to alleviate pollution, resource scarcity and help with climate change, channelling all policies towards waste reduction and reducing its environmental impact [94]. It has shown promising results, but it should be noted that the circular economy seeks to go a step further and to be seen as an optimal option for development [95]. Still, it is worth acknowledging that a reasonable start was made as an important part of the circular economy is municipal management which helps through the creation of jobs along with the reduction and disposal of local waste, so even if it is not much, this is an incentive for its implementation [96].

Therefore, for the development of municipalities and to recognise how the circular economy is a viable path, a local development system must be established that maximises the bottom-up approach by not having a large external regulation that establishes fixed bases. This, in the municipal development forums in the municipality of Almócita, has taken shape excellently, enhancing their role as an attractor and transforming factor of the social, economic, temporal and physical space [97]. With regard to the local development

model and the CE, both are proposed as endogenous measures to promote and strengthen local relations as well as to anchor territorial development to a region's own resources that will create a symbol and generate benefits based on the cultural wealth of the area.

Regarding the use of multiple Rs, it should also be remembered that there are several sectors to focus on. For example, agriculture, in order to face future climate, social and economic challenges, must be organic and more productive [98]. In turn, advances and improvements in techniques such as the use of compost generation, waste control, water pollution monitoring, user perception of fertiliser use, etc. can be encouraged. These processes, such as the use of own compost, can help and provide new lines of research within the CE and related areas, creating new synergies and deposits such as the one followed by slaughterhouse waste [99] by applying several technologies since one cannot finish with all pathogens [100]. This model of life is permeating society and slowly this generalizing influence is helping to create a more sustainable behaviour that promotes CC-based business models, such as the sale of organic compost [101], although further research of a practical nature is needed [102].

However, it is not only in the scientific arena in which dissemination techniques must be suitable and able to reach the population in order to teach it the virtues of the correct application of the CE [92]. At the same time, it is necessary to analyse and understand the behaviour of the population as consumers within this new type of economic system. Recent studies show that consumer systems will have to carry out extensive digital updating work as the largest consumer of these products regularly accesses digital networks [103].

## 6. Conclusions

On a more theoretical level, it can therefore be stated that the circular economy is being embraced by various actors as a sustainable development strategy that generates benefits to both society and the environment, without ceasing to be a highly competitive strategy in the business world. Therefore, the most important result is that it cannot be dismissed as a mere trend, but is in fact a paradigm of action resulting from the evolution of sustainability and the triple (quadruple if the temporal aspect is included) approach.

This is thanks to the inherent change in the conception of production from a linear one to a branched but more comprehensively planned productive circularity with a systemic approach to the design of processes, products and business models, which, in turn, increases competitiveness. It is not seen as a threat to economic growth, but rather as a proposal to make better and more intensive use of what is available.

We must therefore take into account the entire life cycle of the product (from extraction to recovery). It is important to create actions and business models that are used to implement the CE correctly and thus have relevance at all scales (micro, meso and macro). In this sense, circularity needs to be discussed in different arenas, not only at large national and supranational levels. The limitations of the circular economy must be highlighted in order to reach common agreements that establish the strategies to be followed in each of them.

For its successful achievement, it is necessary not only to implement transversal public policies such as the evolution of the term itself, but also to allow time for citizens to become aware of their consumption, for the research field to carry out the relevant analyses and provide knowledge, and for the business field to ensure that this sustainability will be reflected in its economic, social and environmental results.

Therefore, it is necessary to implement a local development model that seeks to revitalise the local economy, taking advantage of local capacities while, at the same time, trying to alleviate the major problems facing its inhabitants, such as the lack of knowledge, innovation and regulatory framework.

At the level of the research proposal, in the case of the municipality of Almócita, the appropriate actions have been taken to implement the circular economy. Both public and private projects have been carried out in which the three or nine Rs are easily recognisable. In particular, dissemination and attraction work are being carried out to create a strong core of awareness that will help with future projects, creating a main line of action.

However, focusing on agricultural activities, the circular economy has been stagnating, requiring extra participation to improve and to create new factors of progress. It can be seen that traditional farming is being strongly advocated, eschewing a newer conception and giving the impression, in part, of an outdated rural society. More research should therefore be conducted on advancing the techniques used, as well as improving trade channels on a prudent scale so that the main livelihood of the municipality can evolve.

The municipality's own compost generation and utilisation activities have been mentioned and these should be better monitored. Currently, only the percentage of tons generated is measured along with its subsequent place of use, leaving aside the possible beneficial analysis for the crops on which this fertiliser is used.

With regard to the other activities, mainly of an economic nature, such as the Energy Community and the promotion of sustainable tourism, a more exhaustive analysis should also be carried out.

This shows that the projects carried out, and future projects, framed almost entirely within the circular economy, are helping the municipality to subsist thanks to the fact that it is a focus of attraction for the new population, at least during the last 10 years, this being the generation that has followed this practice more closely. Statistically speaking, the municipality had been declining from 541 people in the middle of the last century to 166 at the beginning of the 21st century [76]. This new approach has performed a job of attracting a population because although the number of births is always lower than the number of deaths, leaving a negative growth curve [78], the number of inhabitants has been growing and remains stable thanks to the movement of new families. Even so, it seems to be focusing too much on the ecological aspect, leaving aside the economic and especially the social. The division of thinking within the municipality itself is one of the problems observed that must be addressed in order to continue to carry out the projects in the right way.

For this reason, a series of objective proposals are proposed with respect to the most evident deficiencies observed in the municipality during the study, which can serve both for the municipality itself and as a wake-up call for other municipalities interested in their application. Observing how the central focus of the municipality is agriculture should in turn make it more involved in economic life. Therefore, it should be an attractor of new sources of employment that improve the economic and social situation, not only being a way for the distribution of products in short supply chains. Regarding the remaining projects, "energy self-sufficiency, pro-consumption community and elimination of wiring in facades" would focus on strengthening the local economy thanks to the creation of this cooperative and the diversification of development plans; the "self-managed cohousing" and "ecological housing in use" would serve to strengthen development while improving ties in the environment. The "green buildings-smart multi-services for the settlement of local entrepreneurs in rural areas" would also help diversify and strengthen the local economy along with the "Plan for mobility and sustainable tourism". The rest of the projects, such as the "Ecological forest" and the "Organic waste 0" will help to preserve the environment and to update this important agricultural production.

The application of the circular economy is in line with the solutions proposed for and by the municipality and its temporary maintenance, although less attention seems to be paid to those related to the social factor (age, public services and development of ties in the environment), followed by the economic section (since no new trade techniques are seen, for example). The circular economy seeks, as has been said, to be a new economic system that contributes to mitigating the environmental impact caused by the development processes, but also seeks to improve productive efficiency and increase the quality of life and well-being of all. Therefore, the orientation followed by the municipality should be followed, but new sources of employment linked to this way of life should be taken into account. Regarding the replicability of the projects, those carried out in the municipality are easily exportable as long as a corresponding analysis is carried out to see if they have

similar characteristics since, as has been said, especially the geographical and social aspects have a great influence on the achievement of these actions.

Finally, this study shows the positive evolution of the municipality over the last 14 years, but at the same time, it suffers from limitations. Especially being a single municipality allows to analyze it to better verify the results, but possibly the area should be analyzed to see if the development mechanisms carried out by neighbouring municipalities are also serving as a focus attractor area and only the circular economy is not the pioneer, but it is a factor to be taken into account. In turn, the period of the actions analyzed is those that have taken place since 2008, although Almócita in Transition started in the last 2 years. Therefore, the present study should be continued to see if the results are constant, efficient and sustainable over time. Finally, and as another limitation, the size of the municipality exposes projects of a minor nature that should be reconsidered when they are carried out in large cities, making an analysis on a smaller scale always necessary.

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## 2.2. COMPLEMENTARY CURRENCIES: AN ANALYSIS OF THE CREATION PROCESS BASED ON SUSTAINABLE LOCAL DEVELOPMENT PRINCIPLES

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2018	44/116	Q2	62.50	2018	3/6	Q2	58.33
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Article

# Complementary Currencies: An Analysis of the Creation Process Based on Sustainable Local Development Principles

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**Abstract:** Complementary currencies are a reality and are being applied both globally and locally. The aim of this article is to explain the viability of this type of currency and its application in local development, in this case, in a rural mountain municipality in the province of Almería (Spain) called Almócita. The Plus, Minus, Interesting (PMI); “Flying Balloon”; and Strength, Weakness, Opportunity (SWOT) analysis methodologies will be used to carry out the study. Finally, a ranking of success factors will be carried out with a brainstorming exercise. As to the results, there are, a priori, more advantages than disadvantages of implementing these currencies, but the local population has clarified that their main concern is depopulation along with a lack of varied work. As a counterpart to this and strengths or advantages, almost all the participants mention the support from the Almócita city council and the initiatives that are constantly being promoted.

**Keywords:** local development; PMI; SWOT; Flying Balloon; currency; local council; society; Almócita

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## 1. Introduction

In recent years, alternative currencies and secondary exchange methods different from legal tender have been developed as mechanisms for stimulating the market [1]. These are so-called complementary currencies (CC). They can be defined as “an agreement to use more than legal tender as a medium of exchange, with the purpose of linking needs not otherwise met with unused resources” [2]. That is, they are an alternative means of payment that, like money, can be exchanged, act as a unit of account, and have their own pricing mechanism.

While official currencies may have structural flaws [3], communities can rely on other mechanisms aimed at creating a more sustainable society [4,5], since all social groups have something they can contribute and offer to the market to promote the well-being of an area [6,7]. The inhabitants who participate in these currency schemes find in their use values such as equality, reciprocity, trust, or voluntariness, an activity which in the past has been underused [8,9].

CCs have been and are, therefore, a point of support for the economy even in depressed regions after periods of crisis (Table 1). These currencies have improved local development, favoring internal economic flow, preventing large accumulations of capital, and maintaining the local environment by preventing capital flight given its territorial limitation. Some examples from the last century would be the Wära, Arbeitswertscheine, and WIR currencies, all of which were created during the Great Depression. The first one we highlight because of its creation of a private nature improving a small

local economy [10]; the second one, on the contrary, was this time of popular initiative guided by the council and it reached very positive results [11]; and the third one, beyond its repercussion at that time, has formed a system so strong that it still exists today [12].

**Table 1.** Examples of complementary currencies created in the 1930s.

Name	Country	Region	Active	Success Rate
Wära	Germany	Europe	1931–1931	It had a value of 1 wära equal to 1 reichsmark. In a community of 500 inhabitants, it managed to generate between 45 and 60 jobs, being the complementary method of payment during its short period of existence. It had its own shop which operated with Wära. After the ban on the currency, the region's economy was again depressed to pre-war levels [10].
Arbeitswertscheine	Austria	Europe	1932–1933	Its value was also 1 arbeitswertscheine was equal to 1 shilling. Its beginning was favored by the City Council of the municipality of Wörgl, and it had some movements of approximately two and a half million shillings. The profits were destined to multiple social projects and it was noticed that while unemployment in Austria rose by 19%, in Wörgl it decreased by 16%. [11]. One year later it was banned by the Oesterreichische Nationalbank, and with it the rates of unpaid bills and unemployment returned to their previous course [12].
WIR	Switzerland	Europe	1934–present	WIR was founded in 1934 and is referred to nowadays as the WIR-bank. Currently it is a centralized credit system for multilateral exchange, with no physical currency. The WIR system functions as a cashless payment circuit between members and has a value of 1 wir is equal to 1 Swiss franc. It was developed due to the cash shortage of the banks which led to less credit being granted. The WIR system therefore supported small and medium-sized businesses in its early days [12]. Its use became more widespread until personal participation was allowed. The balance sheet of WIR Bank shows roughly CHF/CHW 4 billion (EUR 3,5 billion) [13].

Source: Own Compilation.

However, it can be seen that CCs have not only been currencies with relevance at a historical level; in fact they are tools that can be used, and are used, today. The problem that arises is that there is no database to summarize them. It is difficult to count them from the beginning, since there is no single list to check their operation or efficiency, but this does not mean that they have ceased to be created and coexist with the world's legal currencies (Table 2).

**Table 2.** Worldwide examples of complementary currencies in use.

Name	Country	Region	Active	Success Rate
Calgary Dollar	Canada	North America	1995–present	The Calgary Dollar is a complementary currency that has experienced several changes. It has recently been re-launched as Canada's first local and digital currency to be updated. It differs from the crypto coins in that they are not purchased or retired. Users can earn it by placing ads for goods or services they want to sell or exchange through their own online store or through the mobile application [14].
Chiemgauer	Germany	Europe	2003–present	It is a CC that has a total number of users of 3922 and was supported by 561 companies during 2015. This gave the Chiemgauer money an approximate base of EUR 787,000 [15].
BerkShares	United States	North America	2006–present	BerkShares can be obtained at participating bank branches in exchange for U.S. dollars. The exchange rate is 95 cents to 1 BerkShare. There are about 400 businesses that accept this CC [16].
Brixton Pound	United Kingdom	Europe	2009–present	This currency is focused on an urban context. It has been designed to maintain and help local exchanges and production in the city. Some 250 companies accept payment via Brixton Pound (BE) [17].
Ora	Orania, South Africa	Africa	2004–present	The Ora is a complementary currency that offers a 5% discount to buyers. About R400,000 to R580,000 worth of Oras were in circulation by 2011 [18]. They are currently updating the platform to e-Ora which is a digital version of the currency. They are not looking for a direct replacement of the physical currency [19].
Better Bartering credits	Tasmania, Australia	Oceania	2015–present	It might be the most recent currency (LETS) of those mentioned and has the smallest number of users. This does not imply that they are inactive, as they carry out many events that they advertise through their website. In exchange, 1 Better Bartering (BB) equals AUD 1 or has the commercial value of a AUD 440 service [20]. It draws attention to that difference in exchange price makes services more influential in the community.

Source: Own Compilation.

Thus, the use of this type of currency makes them a social movement of change from the current system towards a more sustainable, equitable, and human-centered local economic system wherein the motivational importance of these tools is evident [21,22]. They have the ability to stimulate economic development from a local to a more regional level, for example, by fighting against social depreciation or by increasing the relations of the participating society. The interaction that is generated between people helps to strengthen the bonds of belonging that will directly create mutual trust in the community [23].

In consideration of the possibilities of stimulating the sustainable local development in the areas through the use of complementary currencies, this article will analyze Almócita, a specific rural area in the province of Almería, with the aim of trying to introduce a complementary currency to favor its development.

After the present introduction, the complementary currencies will be analyzed from their concept to their characteristics. A classification table of complementary currencies and virtual currencies is included in the study thanks to the updating trend that can be seen in Table 2. Then the geographical area of application will be analyzed to see if it has positive characteristics to its development and to be able to start with the process of creating the currency.

For this purpose, different local checks will be carried out following the phases established in various coins creation guides [2,24] and their recommendations. It should be noted that the first two stages will be treated initially in order to have a solid base on which to work later and that this will not only be based on an external analysis with information relevant to the creation of the currency, but it will also include a verification of the social reality. The lack of communication between the actors and the failure to take into account the socio-anthropological realities of a territory can lead to the failure of the project [25]. This will be materialized during the whole part of the results showing in order the positive, negative, and interesting factors of applying a CC and that it will be taken into account that more will be exposed to the locals. We will continue with a Flying Balloon made to premises together with information extracted from the Sistema de Información Multiterritorial de Andalucía (SIMA) database that will provide relevant information for the project. All this will be completed with a SWOT and a Ranking of Success Factors.

Finally, the central objectives of the project and the concerns of the environment will be presented together due to their joint analysis. This will show the first conclusions about its viability. This first and necessary contact, may have to propose alternatives for a greater future consensus, extend the framework of action to the adjacent municipalities if they have similar characteristics and thus set a greater basis, or simply discard the idea because of the refusal.

## 2. Literature Review

### 2.1. Complementary Currencies: The Base

The complementary currency, social currency or alternative currency is understood as a monetary instrument, or exchange system, created and used by communities, groups, and individuals in order to facilitate the exchange of goods and services. As central characteristics, we find that it is a system of neighborhood based on trust and reciprocity among people, and with the passing of time it can lose value to avoid speculation through accumulation. These are mechanisms that we can find within the Social and Solidarity Economy (SSE), in French Économie Sociale et Solidaire, whose base is the systematic understanding of human life while maintaining sustainable consumption, although in this case is based more on environmental factors [26]. In them, society sees how to participate in the decision-making of the political body while preserving democratic sovereignty in socio-economic spaces [27].

As their name indicates, and referring to what has already been mentioned, they are currencies that are used in an accessory way to legal tender. The relationship between these currencies and legal tender is ambiguous. This is an added difficulty when legality comes into play. The needs of the community must be well differentiated and once the intervention schemes are established and the action plans examined if they are indeed clear and respond to the social needs without the need for major agents to intervene [28]. The rest is then left to the participants in the life of the currency.

These complementary currencies arise and are created with a set purpose. While the aims or purposes of complementary currencies are multiple, it is these very objectives which are at the very heart of their existence [29]. These CCs take on different guises that are adapted and applied to a variety of situations. Although there are multiple causes, the most prevalent purposes are political, economic, and social, although their basic use will always be as a complement to common money [30]. Based on the aforementioned values, we've taken special note of the LETS model called the System of Exchange and Local Transactions (SINTRAL) of Ecuador, which has generated highly valuable resources such as educational services [31], or the "Banco de Las Palmas", considered as a national model that inspired the community development bank system [32].

Complementary currencies are not exclusively promoted as an economic benefit, although they may have profit seeking aims. It is also common that they also seek communal or societal benefits in them, achievement of an end such as commitment to the environment, or even the search for the collective good. Although as stated, the motivations are varied, it seems without a doubt that they are related to economic ends that should not be forgotten [33].

Given their adaptability and flexibility, the objectives of the CCs can mutate and be transferred to others which may prove to be more consistent over time, although it could also be considered the reason for their disappearance as it generates differences among promoters [34].

The most important factor is that their scope of action is highly focused on supporting development. They are a mechanism that can serve different purposes, whether it be economic, social, environmental, or ethical, can generate new patterns of consumption and production, and promote local trade by creating a re-evaluation of work and wealth in an equitable way [35,36]. These systems help the community by developing sectors such as SMEs, monetary circulation, cooperation between different economic actors, revaluation of endogenous resources, etc. [37,38], giving back to the community some of the power they felt they had lost [39].

The experiences on which the CCs are based clearly show that they are tools that strengthen and develop the economy and the territory in which they are implemented, although they will greatly depend on the area applied [40]. This does not mean them being analyzed as a measure clearly inserted in the framework of the solidarity and social economy [41].

The promoters and participants of complementary or social currency initiatives are usually individuals, professionals from different sectors, and institutions that unite in order to create a network in which the currency will operate. They are in charge of determining the overall functioning and operation of the system. The important thing is that the entity in which all the parties will intervene is created and that the level of societal participation is maintained to be as high as possible at all times. The complexity of the control and diffusion mode influences the durability of the CC, going so far as to show its difficulty in integrating with the other forms of exchange and transaction [42].

As part of the creation process, characteristics such as value, shape, location, and possible legal repercussions are established, since not all CCs are exempt from taxes [27,43]. The use of the currency itself will also be conditioned by what has been agreed [44,45]. In principle, and in a generic way, people can earn and use the complementary currency freely as well as the legal tender, as long as the established limitations are met.

Having explained the concept, the relationship with legal tender, the purpose they follow, and the people involved in their development, it remains to talk about their structure or design. This is possibly one of the most complex sections since there is not a single way to define them. While we remember that there is no database that collects them, there is not a single classification to be able to typify them. This is one of the most complex and previously considered aspects: the design of the currency itself. There is no official classification that meets or covers all the requirements since, being a mechanism created with a specific purpose in mind, the possibilities for development are practically endless. This has resulted in a multitude of typologies of which we can highlight that of Bernard A. Lietaer and Margrit Kennedy in 2004, Siglinde Bode in the same year, or Jérôme Blanc in 2011, which outlines one of the most current classifications based on whether their typology is considered being territorial, communal, or economic.

Having seen numerous examples and their development and starting from a simpler classification system, two typologies will be taken into account to differentiate the currency schemes according to their structure. Thus, virtual currencies, recently incorporated, and local-territorial-social currencies, with a more classical vision, have been selected. The differences between them are several, although their purpose may be similar (Table 3). This classification will be necessary to take into account from the outset, because depending on various local factors, the scale may decline to one side or the other.

**Table 3.** Comparison of virtual currencies vis-à-vis local–territorial–social currencies.

Virtual Currencies	Local-Territorial-Social Currencies
The European Central Bank defines them as “a medium of exchange and a unit of value accepted by a virtual community” [46].	Facilitate exchanges, satisfy a need, or simply as financial aid.
Based on security, integrity, and balance thanks to the protection that has been provided by people who, in exchange for obtaining an advantage / tip, collaborate in the security of the currency by providing algorithm processing.	Based on a principle of development and cooperation, they are currencies that do not have the limitations of legal currencies and that help achieve social and economic ends [47].
Its operation resembles a classic means of exchange with the advantage that payments are made immediately without intermediaries and low transaction costs and exchange is expedited in time.	Their operation is based on trust and reciprocity [48]. They tend to be based on endogenous resources that the formal economy often ignores.
Its regulation is more complex since, at first, currencies were classified as “raw materials” [49]. Since then their classification has varied with each country deciding for itself.	There are multiple problems with this type of currency, including temporal, personal, and their impact on the market [50]. They are factors that need to be constantly tested, from the moment of their development to their latter activation.
This also leaves them at the mercy of significant fluctuations in their price which can be subject to speculation or be used by other parties [51].	Currency valuation can vary depending on whether the purpose of the same is to match legal currency or if it is attempting a temporary match. Its defining feature is that they cannot be services that are directly exchanged for legal tender such as Time Banks [52].
It is usually obtained through so-called mining, which is broadly based on the resolution of complex algorithms that depend on a previous one.	The LETS are basically non-profit initiatives that attempt to promote the exchange of goods and services in a limited community.
All transactions are recorded in a blockchain which is open to everyone. This generates global and transparent exchanges that have a reliability determinant which is deemed to be one of their great advantages. Those based on this technology can cause problems if they are analyzed from the environmentally sustainable point of view in contrast to the most basic digital ones [53].	For its development, an entity is usually created to maintain an operational record. This records in detail all the operations carried out or pending credits. These usually take the form of exchange or barter of minor short-term services separate from their usual provision of professional services.
Can be used at any time.	It is particularly used if the legal economy is paralyzed and its reactivation is complex.

Source: Own Compilation.

## 2.2. Study Region

Once the characteristics of the complementary currencies have been considered, together with the form they should take, it is necessary to analyze the geographical context in which they are applied in case there is any precedent in the area. Here we will distinguish two sections: the first will be dedicated to existing complementary currencies or those that have existed in the area, while the second will be an introduction of the selected rural area.

In the case of the province of Almería, the tools with the greatest weight in the territory have been the Pita and the Banco del Tiempo (BdT) (Time Bank). In addition, the chosen town of the province has been Almócita, a small rural town with a total of 169 inhabitants [54].

Pita is a great example of a complementary currency. It was established in Bajo Andarax during 2012 and had nearly 200 participants. It was born as an initiative of the CCOO Agro-Food Federation (Workers' Commission) and was developed by the Asociación Trotamundos Animado (literal translation: Association of Animated Globetrotters) [55]. The currency had a value similar to one Euro in legal currency or the equivalent of six minutes in the Time Bank that was already in use

in the area. A surplus was established that could not exceed the threshold of 200 pitas and it was impossible to have a deficit greater than 100, in addition to an oxidation of 10% of its value in three months without being used and loss due to the obsolescence of the currency if it had not been used for a year. At the end of each day, each private account was adjusted to maintain proper accounting.

Time banks are clearly structured as a means to promote sustainable economic development [56] and the Time Bank of the Almería City Council is another example that is already on the way to celebrating its eighth anniversary. During its first years it managed to account for a total of more than 4000 exchange hours thanks to more than 400 partners [57]. Due to its link with Municipal Women's Centers, it is spread throughout the municipality and it has multiple services that can be exchanged such as advice, DIY, or social care of people [58]. The BdT continues working today.

Almócita is a municipality in the province of Almería with an extension of 30.83 km<sup>2</sup>, located some 54 km from the capital of the province. It was founded by Arabs and has the typical Moorish urban architecture with one of the best-preserved historic town centers in the province. The town is comprised of simple houses and narrow streets. It is a pueblo blanco (white village) with 171 inhabitants, many of who are concerned about their ecological footprint. The town's economy is predominantly based on agriculture, mainly in the cultivation of grapes and oranges.

It is located in the Alpujarra region (Figure 1) and shares characteristics with the rest of the municipalities that make up this territory. As an identifying feature, we can highlight that the town has a choir which aims to preserve classical folklore, the celebration of the Night of the Candles, an annual initiative in which the town is illuminated with old lamps, torches, etc., while simultaneously turning off all modern lighting. It is also known for demonstrating a high level of concern for environmental matters which is the basis for the celebration of events such as Ecoencuentro (EcoMeet) in which people gather from all areas to attend conferences or organic and "green" markets. However, it is worth mentioning that although the basic characteristics of the village may, at first sight, be similar to those of the surrounding municipalities, the selection of the village has been thankful to have had among its inhabitants people who have previously had contact with the Pita. This fact, explained in one of its EcoMeets, suggests that the population is active in the use of these figures.

### 2.3. Creation Process

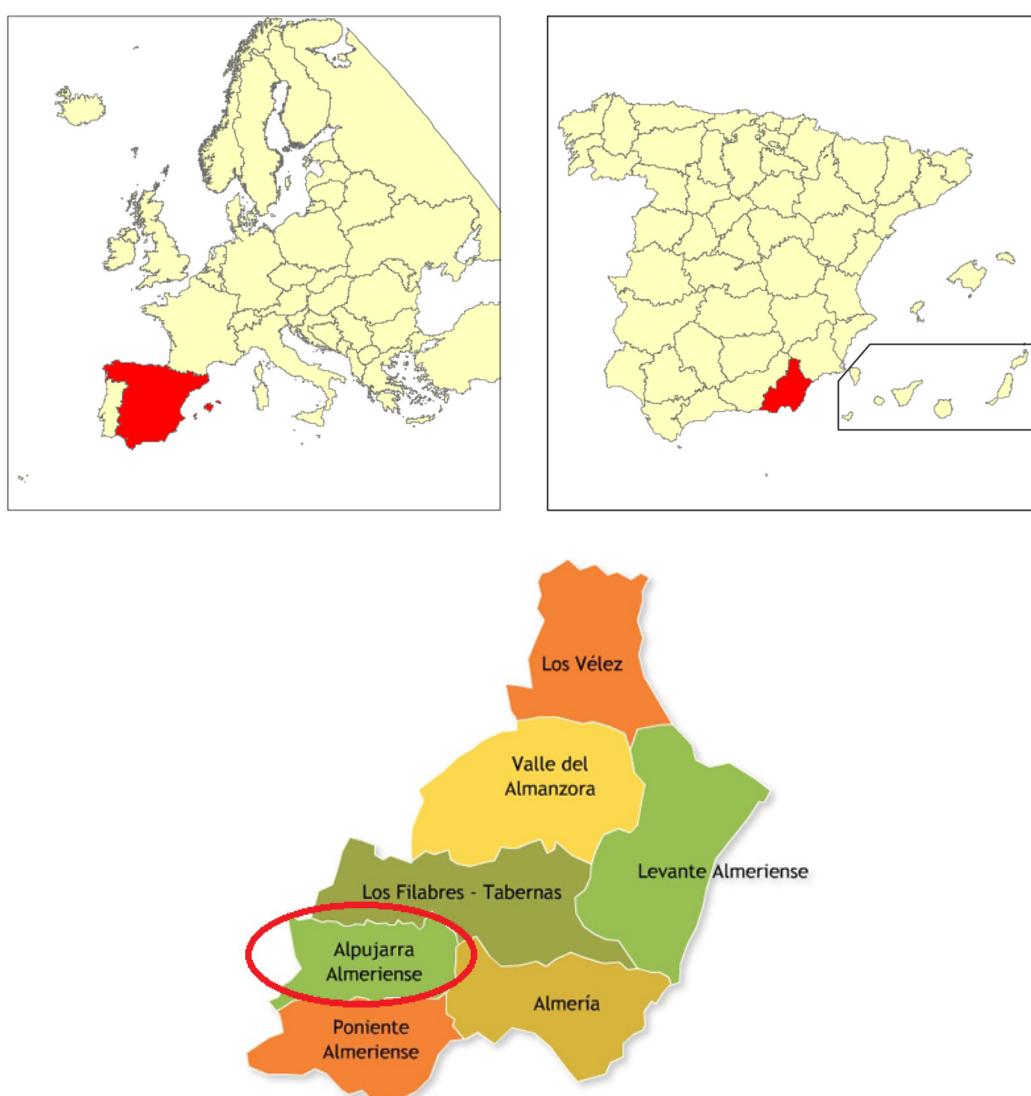
To conclude this section and given this introduction, and for the correct functioning and use of the social currency, it is necessary that the creation process be carried out in as detailed a manner as possible [2,24]. The following steps should be followed:

Step 1. A detailed analysis of the region/territory must be carried out and the needs and resources available must be studied. These resources can support the issuance of the coins. Once this is carried out, the objective of the social currency should be established together with identifying unmet needs, the resources, and the people to whom it is directed. Once these basic characteristics are established, the broad type of social currency is selected: Time Banks, LETS, physical social currency, commercial barter, etc. Goals and specific deadlines should be set to systematically collect all the information in such a way that it can easily be used in the subsequent steps.

Step 2. A highly representative group should be created which involves all the important sectors in order that they can contribute their ideas and see themselves reflected in the proposed currency. The community that will use this payment method must be developed and updated at all times. It is necessary that the process of creating the currency is communal and that everyone feels involved and part of the project. The training received must always be maintained and it is recommended that there be spaces available wherein the community can be updated or learn about the current state of affairs.

Step 3. The type of currency and its representation are definitely chosen, along with the accompanying merchandise, currency, or electronic media. A design is tailored to the purpose of the coin. Once this is done, the form with which it will be supported and the value that will be minted are selected: official money, provision of services, etc.

- Step 4. Once there is a general outline of the currency's structure, the manner in which to execute it must be determined, including a mechanism for covering all related costs. These costs can range from the most basic, such as facilities to be developed, to other more direct costs, such as the printing of the currency. Its implementation can be supported by other institutions, such as foundations, the premises themselves, or public entities such as municipalities that may be willing to contribute. In order to recover the expenses, it may be necessary to establish fees such as transaction or interest for the use, oxidation to avoid its accumulation, or a participation fee.
- Step 5. Finally, it is important to establish a scheme that shows how this tool is going to be issued, put into circulation, and how withdrawals will be made. It is a tool that must satisfy the needs of consumers at all times. Following this, a testing phase should be carried out to check whether it works or not.
- Step 6. Similar to any other action, an evaluation process of the basic indicators must remain open at all times, and, if necessary, the system should be recalibrated in order that its launch be as smooth as possible.



**Figure 1.** Location of Almócita. Source: Diputación de Almería (Almería Provincial Council).

### 3. Methodology

Our research consists of four types of methodology that will help clarify ideas.

Starting from the previously stated assumptions analyzed in the province and in order to take into account both positive and negative aspects, the Plus, Minus, Interesting (PMI) analysis delves into the local implementation of a social currency. This analysis consists of constructing a table or matrix that includes positive, negative, and interesting aspects about a specific topic, allowing innovative conclusions to be drawn. It has been used in research articles that deal with education [59,60] or health [61,62], in order to answer questions through lateral or alternative thinking.

Secondly, an attempt will be made study the current state of the municipality through a “Flying Balloon” analysis together with a series of short questions regarding the local population’s knowledge of complementary currencies. It involves a description of the context of a local development project from an illustration (Figure 2), which defines the main components [63].



**Figure 2.** Illustration of “Flying Balloon”. Source: De Pablo Valenciano et al., 2018.

In the center of the illustration is a balloon, which represents the main territory which is the subject of the diagnosis. To the right of this is another smaller balloon which represents other territories with similar characteristics. The helicopter represents other regions with higher socioeconomic development, whose more ambitious goals may reduce the ability of the main balloon to attain financing. The crow atop the large balloon symbolizes the weaknesses of the territory, while the people flying in the basket represent all the actors involved in local development. The mountains depict current dangers, while the eagle indicates potential threats. Clouds show whether adversity or ease prevail, and the birds around them represent unsuccessful contingencies. The crocodile refers to those groups that benefit from the plan failing, since it would be able to feed should the balloon deflate and drop. Finally, the bags that hang from the basket are a representation of all those expendable actors in the plan which could be considered a burden.

This is an innovative methodology that facilitates the participation of all citizens of a territory due to the intuitive nature of the illustration. Indeed, no reference to this technique has been found in scientific articles from the main databases: Web of Science and Scopus.

The sampling carried out through surveys is summarized in ten assumptions of which:

- Eight show local opinion: five from the habitual residents and three from relevant businesses and economic weight in the municipality.
- The remaining two are the opinion of people domiciled in the municipality but who are not residents.

During this stage, a series of common interviews and visits to the municipality were carried out in order to observe the relational structure of its inhabitants. During the months of April, March, May, and June 2018 a total of approximately eight visits took place, each lasting between 1 and 2 days.

Subsequently, based on data obtained from the Andalusian Multi-territorial Information System (SIMA), the municipality's own website and that obtained directly from interviews, we proceeded to create a SWOT matrix evaluating the state of the municipality to establish the priorities needed to be rectified. This matrix includes the internal elements of the municipality that are either an advantage or disadvantage (strengths and weaknesses respectively), as well as elements from outside the territory (opportunities and threats). The combination of these factors gives rise to four possible strategies: offensive (related to strengths with opportunities), defensive (related to strengths with threats), reorientation (related to weaknesses and opportunities), and survival (related to weaknesses and threats). In the scientific literature, this tool has been used in articles on various topics such as economics and business [64–66], environmental sciences [67,68], or education [69–71].

Finally, a ranking of success factors is carried out with a brainstorming exercise.

#### 4. Results

Taking as a reference the experiences with social currencies, a natural synthesis is proposed via a PMI analysis that shows both positive and negative generic aspects as well as interesting aspects that should be taken into consideration (Table 4). The continuity of the currency project depends on which of these three aspects would vary depending on whether the positives outweigh the negatives.

**Table 4.** Application of Plus, Minus, Interesting (PMI) Analysis.

Positive	Negative	Interesting
<ol style="list-style-type: none"> <li>1. A general increase in purchasing power.</li> <li>2. Simplicity of payments, similar to using legal tender.</li> <li>3. Promotion of social projects.</li> <li>4. The endogenous economy is motivated and supports job creation.</li> <li>5. They support normal monetary infrastructure.</li> <li>6. They are an additional source of income.</li> <li>7. Strengthens relational ties.</li> <li>8. It is difficult to suffer from oversupply and cause inflation.</li> <li>9. It is based on the original idea of money.</li> <li>10. In principle, it retains and keeps wealth within the area.</li> <li>11. Promote an idea of honesty and trust.</li> <li>12. In its most recent implementation, it favors equality as all draw from equal conditions.</li> <li>13. It promotes social justice, equality and the rest of the values that it aims to protect.</li> </ol>	<ol style="list-style-type: none"> <li>1. The monetary system is made more complicated due to additional payment options.</li> <li>2. User may be faced by additional commissions or fees.</li> <li>3. Training is required to use the currency.</li> <li>4. The number of users is very limited, and its use is very localized.</li> <li>5. The massification of some currencies in particular can undermine them.</li> <li>6. The high cost of developing the currency.</li> <li>7. High level of volatility of some types such as virtual currencies.</li> <li>8. The ease with which they can be counterfeited.</li> <li>9. If they are not based on the needs of the people.</li> </ol>	<ol style="list-style-type: none"> <li>1. Analyze nearby municipalities to see their point of view and see if there is interest in participating.</li> <li>2. Check social acceptance.</li> <li>3. Study how the proposed new economic approach can help in the repopulation of the area.</li> <li>4. It could be taken as a reference municipality.</li> <li>5. Carry out analyses that show the increase in general well-being.</li> </ol>

Source: Own Compilation.

It has been shown that a well-implemented social currency helps the economy as stated by Bernard Lietaer in his multiple works already mentioned. Despite this, there are a number of failed currencies; even in areas which pioneered CCs should be known and borne in mind [72].

Having observed, a priori, more advantages than disadvantages along with the possible interesting applications, the “Flying Balloon” analysis was implemented by means of a series of questions about the municipality put to 50 local people in order to collate opinions about their locality and complementary currencies in general. The results obtained are summarized in Tables 5 and 6. The results are differentiated

in the two tables: one shows the more general thoughts of local inhabitants and the second shows the thoughts of local inhabitants who carry out economic activities (local business people) and non-residents.

**Table 5.** Information obtained from Local Participants 1 to 5.

	Local 1	Local 2	Local 3	Local 4	Local 5
<i>Keep</i>	Lack of work	Lack of interest in the town	An ageing population	Environmental Problems	Lack of varied work
<i>Failures</i>	Maintaining population levels	An ageing population	Maintaining population levels	The development of interesting activities, but that were only temporary	Maintaining population levels
<i>Concerns</i>	An ageing population in the town	Maintaining population levels	More populous neighboring town centers	Loss of heritage	School closures
<i>Competitors</i>	Economically stronger and larger neighboring municipalities	Economically stronger and larger neighboring municipalities	The capital city	Neighboring provincial centers	The capital city
<i>Opportunities</i>	Local Festivals	Natural Resources and Local Festivals	Natural Resources	Natural Resources and Local Festivals	Initiatives of the Local Council

Source: Own Compilation.

**Table 6.** Information obtained from Local Business People and Non-Residents.

	Business Person 1	Business Person 2	Business Person 3	Non-Resident 1	Non-Resident 2
<i>Threats</i>	Lack of varied work	Ageing population	Average age of townspeople	Better situated towns with better access	Other competitors in same business activity
<i>Failures</i>	Population	Measures taken to combat depopulation	Population	"Always seeing the same people"	Badly developed policies
<i>Concerns</i>	Ageing population	Maintaining population levels	Average age of townspeople	Sale of their property in the area	Loss of a second job in the municipality
<i>Competitors</i>	The capital city and nearby coastal areas	The capital city	The capital city	Municipalities located in Sierra Nevada but with better facilities	Municipalities closer to the coast
<i>Opportunities</i>	A Local Council and Associations with Initiatives	Good social relationships	Initiatives promoted by the Local Council	Nearby hunting preserves	Local Festivals

Source: Own Compilation.

The local population remarked, before going into detail about the complementary currencies, that their basic problem is the shortage of population along with the lack of varied work. As a counterpart to this and when speaking of its strengths, almost all mention the support from the local council and the initiatives that are constantly being promoted.

That said, for a better understanding of the answers and based on the tables above, the information from the interviews are displayed according to specific categories. These categories include Entities and Services due to the high level of trust in them, Society and the General Economy as personal assessment surveys and Resources with regards to the variables considered to be opportunities.

#### Entities and Services:

- The local council promotes activities to avoid depopulation and favor the settlement of new people in the municipality.
- In addition, it is amenable and actively participates in the discussions. The local inhabitants have great trust in this entity.

- The local council listens to new proposals without rejecting them outright even when financing is required. They state that one of these proposals is related to social currencies and has been discussed on more than one occasion, albeit superficially.
- The town has a health center, a school and a pharmacy.
- The small retail businesses in the municipality speak of problems for their subsistence, although they do not have direct competition around them: lack of change due to sales, complicated maintenance of some types of products, etc.
- Of the two bar/restaurant services that exist, the bar, which recently reopened following a change of ownership, is the only establishment that consistently remains open. The restaurant only opens on weekends except for in the summer months when it is opened on a daily basis.
- The owners of the bar have known complementary currency initiatives.
- There are good public transportation links to the capital which run approximately three times a day.
- Nearby municipalities are well connected and include various hiking trails and a bike path.

#### Society and Economy:

- The residents take an active part in municipality events and matters and detect depopulation as a factor that must be eradicated.
- There is no direct rejection of people from outside the municipality.
- The average age of the population is quite high.
- The inhabitants highly value the cultural programs in which they participate.
- There is a lack of significant generational replacement, a problem that also exists in neighboring municipalities.
- There is a strong feeling of belonging to the locality, although limited employment possibilities make it difficult to maintain the population.
- The real population does not coincide with the official census population.
- In terms of average income, their amount is greater than expenses incurred.
- The municipality has people who have knowledge of the issue of social currencies, for example, of the drivers of la Pita. In turn, some have reacted positively to whether or not they knew of the existence of websites such as "vivirsinempleo.org", which highlight, among others, issues related to CC.

#### Resources:

- The ecological approach which is established in the municipality is promoted as a resource which can attract newcomers to the area.
- The state of heritage preservation of the town is very good.
- There is little exploitation in the tourist potential of the town, and its denomination as a pueblo alpujarreño (mountain town).
- The town possesses its own unique resource, the largest lamp in the world.

To summarize, the local inhabitants focus their attention on the lack of generational replacement and the aging of the population. Depopulation is a central issue in the municipality.

To prepare the SWOT matrix, the previous results and information provided by SIMA were taken into account. Taking 2006 as the base year for some of the variables, it has been possible to perceive record progress and the evolution of some of the most interesting concepts. Consequently, we will first analyze the composition of the population to later delve into more economical aspects.

As can be seen in Table 7, the population of the neighboring municipalities seems to be static, with Almócita arguably presenting the most favorable growth rate. In particular, although it is true that in terms of number of inhabitants, this figure has increased since 2018 by 18 new residents, the current trend is one of decline. The population during the years 2006 to 2011 experienced a significant increase,

growing from 156 inhabitants to 191, although later decreasing to the current 174 registered in 2018. In fact, broadly speaking, there has been a relative increase in the population of approximately 10% in the last ten years. However, this rise occurred exclusively during the first six years observed. The average age of the population is 53 years, not the highest in the area as Beires has an average of 59 years. Without doubt, this reinforces the fact that it represents the average age of the population in the region.

**Table 7.** Evolution in the Population of Almócita and surrounding towns.

	2006	2011	2018	Population Change Between 2006 and 2018
<i>Almócita</i>	156	191	172	10%
<i>Beires</i>	128	118	114	-10%
<i>Dalías</i>	3807	3991	3978	4%
<i>Fondón</i>	950	976	1017	7%
<i>Padules</i>	523	510	449	-14%

Source: Own Compilation.

The community has a municipal unemployment rate of 20% with a total of 20,186 people out of work, the highest rate of its kind in the area. The remainder of the municipalities have an unemployment rate of between 14% and 18%. Registered unemployment is comprised mainly of people aged between 45 and 64 with a higher ratio of women among them. This is followed by people aged 30 to 44, wherein the ratio of women who are unemployed in this age bracket is 2 to 1. The lowest unemployment rate was registered in ages between 16 and 29, with the gender trend already mentioned also present in this age range.

The most prevalent professional activities carried out in the municipality are those related to Division five and six of the SIMA classification dedicated to construction and commerce, restaurants, lodging, and repairs with a total of five and six, respectively. The next most common economic activities are those related to the extraction and transformation of non-energy minerals and their derived products, industries for the transformation of metals and precision mechanics, transport and communications, and financial institutions, insurance, and services provided to rental companies with one business in each sector (Division two, three, seven and eight). There are no businesses from the remaining divisions in the area. It can also be affirmed that the number of establishments has grown significantly by four new businesses since the population increase took place.

The most common economic activity in the municipality is agricultural, with several hectares of land classified and dedicated to organic production. Regarding the tourism sector, the number of rural houses in the area is scarce, but it does provide a small number of services related to the tourism sector.

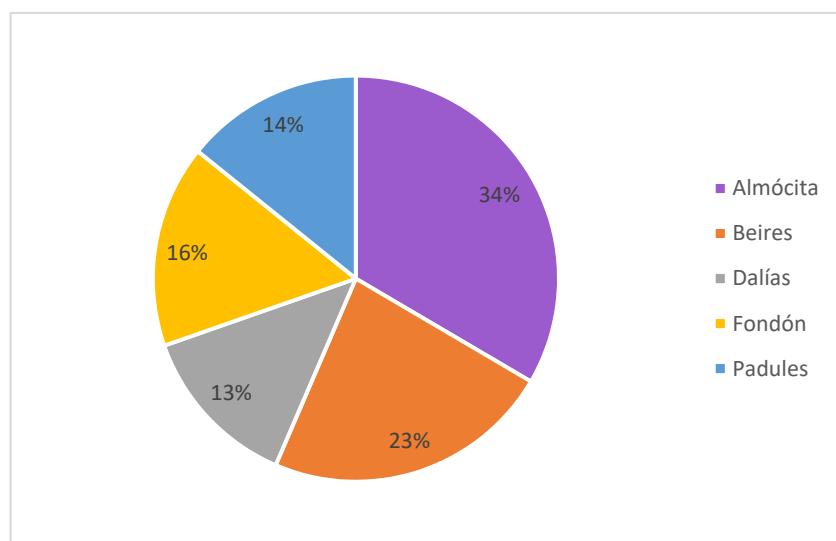
Almost all the companies in the area are small in size, since the majority, 12 out of 16, are companies with no employees and another two employ fewer than five people. The two business with the highest levels of production employ between six and nine workers.

An analysis of the numerical data displayed in Table 8 shows that the area is financially healthy. Income per inhabitant, as seen in Figure 3, is the highest if we take 100 as the reference number.

**Table 8.** Budget of Local Businesses in 2018 \*.

<b>Final Budgeted Income</b>	451,862
<b>Final Budgeted Expenses</b>	450,083
<b>Income by Inhabitant</b>	2611
<b>Expenses by Inhabitant</b>	2601

\* The reference currency is the Euro. Source: Own Compilation.



**Figure 3.** Income by Inhabitant in Almócita and surrounding areas<sup>1, 1</sup>. As data was available for 2016 for all municipalities except Beires, it was decided 2015 would be used as the relevant year for data collection. In general, income decreased in Almócita and increased in the remaining areas. Source: Own Compilation.

With regards to taxes and based on the return filed for 2018 (Table 9), income does not show entirely positive results as the average income remains fairly low.

**Table 9.** IRPF (Personal Income Tax) for 2018 \*.

<b>Number of Tax Returns</b>	56
<b>Employment Income Tax</b>	268,774
<b>Actual Net Taxable Income</b>	7771
<b>Estimated Net Taxable Income</b>	6155
<b>Other Types of Income</b>	26,538
<b>Average Net Taxable Income</b>	5522

\* The reference currency is the Euro. Source: Own Compilation.

Table 10 shows a SWOT analysis which highlights the lack of population as the principal negative axis. This analysis agrees with the perception of local residents, who see this and the lack of varied jobs and services as the most pressing problem for their economy. In contrast, a positive attitude is evinced by their concern for the environment and the acceptance of new initiatives as long as they have the support of an important entity such as the local council.

**Table 10.** Strength, Weakness, Opportunity (SWOT) Analysis of Almócita.

Weaknesses	Threats
Aged population Lack of financial resources Lack of entrepreneurial culture Lack of services in the area and difficulty in maintaining existing ones Lack of financial subsidies to carry out activities Apathy and lack of motivation among young people: desire to leave Unused resources Scarcity of variety in tourist offer Initial negative reactions to mention of a new currency	Excessive bureaucracy Lack of generational replacement Limited employment Climate change and desertification Rural exodus Disinformation and lack of recognition of the area Lack of public or private economic resources Political changes Rejection of abrupt economic changes
Strengths	Opportunities
General climatology Rise of environmental awareness Heritage Existence of the Natural Preserve and National Park of Sierra Nevada Quality of life Programs initiated by the Local Council Participatory and active women Eagerness to excel Excellent local environmental awareness Assimilation of environmental awareness Innovative spirit that assimilates the proposals and participates in them	Increased awareness of the natural product consumption. Promotion and campaigns with a more human touch that create greater social sensitivity. Local Council support for the development of a local currency. Rural development programs with justifiable outlay. Boom of Themed tourism based on the social and environmental factors as an extra source of income. Improvement of the economic situation focused the ecological and tourist factors while stimulating the economy using social currencies. Ability to attract new residents who share same values. Retain the existing population through the use of an exclusive currency in the area.

Source: Own Compilation.

Finally, a ranking of success factors is carried out and displayed in Table 11.

**Table 11.** Ranking of success factors.

	Weaknesses	Threats	Strengths	Opportunities
	1. Ageing Population 2. High economic costs 3. Initial negative reactions	1. Rural Exodus 2. Employment 3. Disinformation	1. Heritage 2. Citizen Engagement 3. Institutional Support	1. Promotions and Campaign 2. Exclusivity 3. Economic recovery
Cost	D1-D2-D3 Unprofitable and unaffordable costs	A2-A3 Alternative, non-competing payment methods	F1 Possible private barter	O2-O3 Increased purchasing power
Local Support	D1-D2-D3 Lack of support without explanation or demonstrable interest	A3 Lack of acceptance	F1-F2-F3 Promotion of the feeling of "belonging" to the town	O1-O3 High levels of participation as long as there is a perceived common benefit
Labor Force	D1 Need of re-population	A1 Lack of human resources	F2 Participation in activities	O2-O3 New ways to prosper economically and support the existing economy
Municipal Plan: Development of Complementary Currency	D1-D2-D3 There is currently no assigned market	A1-A3 Lack of population that supports the plan	F1-F2-F3 Greater value placed on "local"	O1-O2-O3 In general terms, it improves the municipality

Source: Own Compilation.

Based on the above, two objectives can be obtained (Table 12).

**Table 12.** Objectives.

Objective 1: Development of Social and Environmental Campaigns.	Objective 2: Development of a Social Currency.
Provide greater social awareness	Investigate and explore additional objectives in creative meetings
Explain the possible approaches for economic development	Unite local environmental awareness philosophy
Approach and attract new participatory residents	Sample the situation after its development
Highlight existing institutional support	Be a pioneer in social thought

Source: Own Compilation.

## 5. Discussion

The experiences have been collated in the province of Almería. The assumptions presented in Table 13 were the basis of the investigation.

**Table 13.** Research Approach.

Location	Almócita
Objective	Assess the viability of a social currency through a multi-level analysis
Innovation	Use a different tool as a way to analyze local development in the area
Insights	Establishment of a local development approach that could be extrapolated to surrounding areas
Expected Impact	Improve the health of the municipality in general: from economic to cultural strengthening

Source: Own Compilation.

Although the main focus of our analysis has been the issuance of complementary currencies, from the results obtained, it can be deduced that the basic concerns of the municipality are consistent with other recent studies and strategies they are following [73–75]. These concerns, which relate to the problem of depopulation is the central focus of many of the initiatives that have been carried out in the municipality. Concerns about depopulation and the lack of work are determining factors for maintaining the economy of this area. Given these circumstances and seeing that the loss of rural areas is a global problem, an analysis of other social currency initiatives, such as the case of Hokkaido in Japan, which has been successful in mitigating the effects of depopulation, would be useful [76]. In the aforementioned case, the socio-cultural strengthening in addition to the increase in commercial and non-commercial transactions of these networks favor rural development.

Although the advantages for the municipalities are small and the expected economic benefits are lower, the CC will create a social capital that they did not have before [77]. This makes money seem more social and moves it away from the vision of money as only a means of exchange and reserve of value [78]. In this way money will transmit the value of strengthening society showing it as what we call “social commons” [79].

The sustainable development initiative with the new CC in Almócita should be focused on the exchange of goods and services that would keep the local economy active in a traditional manner. This is what we mean in terms of form; given the number of inhabitants and the average age of their community the principal scheme should be based on a physical currency or some kind of log book of transactions for ease of assimilation that can later be updated.

The local council’s continual commitment to its population encourages the development of these proposals. After reluctantly responding to the use of this currency, those who were initially surveyed reconsidered their position when it was mentioned that the local council supported the scheme, even going on to attend the most recent development meetings. The multitude of social and ecological events, together with the mindset of the inhabitants, have created a culture of strong sustainable development that should, leveraged by this initiative which is promoted by both the

local council and residents, make it much more stable [80]. The concern for the council along with having its financial backing, makes this currency more similar to the English ones, such as the Brixton Pound and Bristol Pound, than to those that were initially taken into account as Pita, whose support was private [81]. At the same time, they are currencies that have lasted longer because Pitas were suspended while this project was being carried out.

As there are no banks present within the municipality, and the inhabitants of Almócita and its surrounding area find it difficult to access cash. The inhabitants and businesses themselves consider this as a major inconvenience. Although the neighboring towns are quite close and accessible, commuting to those towns for purchases or investments of low value is an inconvenience that the residents end up resolving by alternative means. Payments for available municipal services, such as the entrance fee for the swimming pool, are subject to the same inconveniences. Certain CCs have their own network of entities which participate in their exchange scheme and position this currency as a secondary way of overcoming these hurdles. An example of this is the Bristol Pound, which has been analyzed to verify its impact on the local economy, although with varying results [82,83].

Incomes are not as high if they are compared with other town centers. There are many small orchards in the municipality and surrounding areas that, together with the minimum income earned, support the local economy. The new and complementary form of payment would mean the reactivation of jobs or even generate new ones that would be incorporated into the economic cycle. If the local infrastructure is sufficient, policies focused on economic factors should be created that are the most appropriate to combat depopulation and the possible extinction of the municipality [84].

## 6. Conclusions

In general, the complementary currencies that have been implemented have garnered several advantages during their lifecycle that should be taken into account. Creating a sound baseline during its development phase will not only help the local economy by reactivating it, but as these schemes could reinforce the legal currency, they could also be a support measure to mitigate the consequences of possible financial problems.

The support from the local council for these currency schemes has positively influenced the local population's level of acceptance for them. The local residents' knowledge of this type of currency, together with the aforementioned support of the local council transforms, their society into one wherein there is a high probability of implementing these schemes.

The mode of tourism currently being exploited together with the environmental resources in the area could be of interest and could attract new members to the community who would be motivated by similar communal thinking. Motivated by the same idea, they would actively participate in the lifecycle of the CC.

The local economy would be reactivated, and income would be generated in new ways that had not previously been taken advantage of.

The local initiatives that have been developed have strengthened the thinking and feeling of belonging to the area and contribute to the realization of these initiatives and increases the chances of meeting the projected objectives.

The resources in the municipality are considered to be adequate for now, and although the transport links with neighboring towns are relatively rapid given the short distance between them, they can often complicate the life of the local residents, particularly older inhabitants. These inconveniences could be alleviated by the new payment method and should be highlighted in the development meetings.

Having one of the highest unemployment rates in the area, the development of economic activities which the new currency could facilitate could thus employ more people and stimulate the local economy.

First, and in a more practical way, it creates a window of opportunity for the real and effective development of a social currency in the municipality, always bearing mind the steps previously outlined. Given this sound foundation, and with the information that has been obtained from and

supplied to the local inhabitants, the launch of a social currency is possible. The population has been made aware of the proposals and there is a first draft that specifies a series of advantages for its town.

On the other hand, and this time in a more theoretical way, a generic analysis of complementary currencies has been carried out. However, it should be borne in mind that a clear and obvious typology does not currently exist given the complexity of identifying the relevant factors and characteristics of a given municipality or territory. Further specific research could also be conducted on complementary currencies.

The work has been largely limited by analyzing a very specific area over a short period of time. During the year of meetings, interviews, and raising the issues, two very different municipal viewpoints have emerged. However, the results obtained from the databases have passed the first cut.

With regard to the social perspective, the development of a complementary currency is not still possible since, although the economic weight of the municipality sees its application and use as feasible, there is a large percentage of users who do not see the need at first sight. There is a necessity to balance the percentages more, and emphasis needs to be placed on the population to see if their perspective changes. An action group (from phase/step two) should be defined so that, together with the City Council, they can have municipal meetings to explain the objective further.

At the same time, and as a contingency plan, it would be possible to analyze the four neighboring municipalities to see if they have similar characteristics and offer them participation in the common project.

To conclude, and no less importantly, this work has tried to verify the feasibility of introducing a complementary currency in a small municipality as a method of sustainable local development, but during this process, and since the introduction, it has been shown that these mechanisms have been and are quite useful for multiple purposes. Thus, complementary currencies are a tool that can reduce the harmful effects of global monetary and financial crises [12], leaving open new lines of research that highlight the possibility of relating the CC with the currency crises in emerging countries [85]. The single currency model creates a super-efficient monetary system on a macroeconomic scale, but it also reveals the lack of resilience in our economy. This “dual feeding” increases the resistance to the effects of the crises, providing stability to the whole system. At a more micro level, it also opens up the possibility of making a greater and deeper “case study” which has already been included as a limitation.

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## 2.3. A BIBLIOMETRIC REVIEW OF CRYPTOCURRENCIES: HOW HAVE THEY GROWN?

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1er decil		
Business, Finance 8/111		
Social Science, Mathematical Methods 1/53		
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Categorías (SJR): Finance

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CATEGORY

BUSINESS, FINANCE

**8/111**

JCR YEAR JIF RANK JIF QUARTILE JIF PERCENTILE

2021 8/111 Q1 93.24

2020 20/110 Q1 82.27

2019 14/109 Q1 87.61

CATEGORY

SOCIAL SCIENCES, MATHEMATICAL METHODS

**1/53**

JCR YEAR JIF RANK JIF QUARTILE JIF PERCENTILE

2021 1/53 Q1 99.06

2020 9/52 Q1 83.65

2019 6/51 Q1 89.22

Fuente: Journal Citation Reports

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RESEARCH

Open Access



# A bibliometric review of cryptocurrencies: how have they grown?

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## Abstract

With the development of new technologies, some concepts become relevant in the economic area, as is the case with cryptocurrencies, in general, or Bitcoin and Ethereum, in particular. Due to the impact of these tools, a detailed bibliometric study that allows us to obtain all information about cryptocurrencies must be conducted. This study will help scientific production by specifying the development and lines of related research that have been followed and are currently being followed. We have used Tableau, R (Bibliometrix R Package), and VOSviewer software to analyze the information. These have been combined to create and review unified metadata from the Web of Science (WoS) and Scopus databases. The bibliometric analysis shows 771 articles on the WoS database and 648 articles on Scopus published between 2010 and early 2019. They present the most relevant articles, research areas, countries, institutions, authors, journals, and trends during the last few years. In conclusion, the number of publications has grown in the last 3 years. The analysis shows the evolution of block-chain technology used in this type of cryptocurrency. The review of this period marks a possible end to the historical part of cryptocurrencies, thereby opening the current topic to its multiple applications.

**Keywords:** Cryptocurrency, Bitcoin, Ethereum, Bibliometric analysis, Business and economics

## Introduction

In the last decade, secondary payment methods other than legal tender have been developed to boost the market (Corrons 2017). Lietaer and Hallsmith (2006) defined one of these payment mechanisms as an agreement to use more than just legal tender as a means of exchange to link unused sources to unmet needs. In particular, a series of complementary currencies incorporated into the economic world are mentioned. Although these new supplementary payment methods are not listed in any global database, more than 6000 types are presumed to exist. Among them, new electronic payment methods have recently been incorporated, including virtual currencies or cryptocurrencies. Although complementary currencies have been used for a longer period, by historical amount and weight, the central focus of this study is the most innovative cryptocurrencies.

A broad spectrum of terminology are coined to differentiate between these cryptocurrencies, ranging from virtual complementary currency to electronic currency and its derivative, cryptocurrency (Dai 1998). The first currency to become popular was Bitcoin, which was founded in 2008 by Satoshi Nakamoto. Although previous attempts at virtual currencies, such as E-gold in 1996 or Liberty Reverse in 2006, have been made, Bitcoin was the first to exist in the global socio-economic sphere (Garcia et al. 2014).

During these cryptocurrencies' short period of existence, they have been and are studied by a wide variety of disciplines, as they incorporate a number of innovative technologies, such as blockchain, cryptography, and smart contracts (Xu et al. 2019). Several studies have characterized cryptocurrencies as having a volatile future (Urquhart 2016; Katsiampa 2017; Chu et al. 2017; Conrad et al. 2018; Bouri et al. 2019) and initially presented them as non-perishable albeit secure. However, these promising technologies have kept them (Zheng et al. 2018; Zulfiqar and Gulzar 2021). The globalization process to which they are subjected, together with the lack of legal regulation, indicate that they have been used in multiple forms as the primary component (Gomá-Garcés 2014; Zimmer 2017). They are also the subject of much discussion and debate by entities, such as the European Central Bank (2012) seeking to better define them as a means of exchange and a unit of value accepted by a virtual community.

This article aims to contribute to the extant literature by conducting a bibliometric analysis of the main currencies, as the number of publications on this subject is increasing. Therefore, a review of the materials published in this interdisciplinary area must be incorporated. Moreover, this methodology is applied in multiple areas of knowledge from the mapping analysis of bibliographic information obtained from high-impact databases.

First, we will focus on Bitcoin and Ethereum as the main currencies and the concept of cryptocurrency. The results obtained are intended to inform about a specific field of study and its evolution and productivity. In addition, they help identify, analyze, and organize the main elements of the search focus to show the evolution of trends in the subject. Finally, the results seek to establish whether major changes occur in the lines of research to determine whether the theoretical part is more irrelevant. In this case, the new lines of research will be more practical, changing their orientation and making the previous publications more historical-theoretical.

This method has been used in several studies with similar themes. However, unlike previous studies (Table 1), the present study considered three keywords, along with a new temporal division in the discussion. Exclusively and to increase the importance of this article, this study will include the results of "cryptocurrency, Bitcoin and Ethereum," thus covering a broader index of results with economic topics from the Web of Science (WoS) and Scopus databases. This differentiates it from the works related to blockchain only as a concept that does not come into discussion, from those that analyze Bitcoin only (e.g., Merediz-Sola et al. 2019; Orastean et al. 2019; Shen et al. 2020), or those that only examine one database (Dabbagh et al. 2019).

This study begins with an introduction and a literature review on alternative forms of payment and their different concepts and interpretations. Then, it explains which selected payment systems have the greatest impact. The methodology of the bibliometric analysis and the sources used to extract the data during the search process are then

**Table 1** Comparison with previous studies

Differences	This Paper	A bibliometric analysis of bitcoin scientific production. Merediz-Sola et al. (2019)	Bitcoin In The Scientific Literature—a Bibliometric Study Orastean et al. (2019)	Research development of Bitcoin: a network and concept linking analysis. Shen et al. (2020)	The Evolution of Blockchain: a Bibliometric Study. Dabbagh et al. (2019)
Data base	WoS Scopus	*	*	*	*
Keywords	Bitcoin Ethereum Cryptocurrency	*	*	*	*
Documents and citation references		*	*	*	*
Research Area		*	*	*	*
Country		*	*		
Institutions		*			*
Journals		*	*		*
Authors		*	*	*	
Keyword Trends		*	*	*	
Discussion		*			*

Source: Own compilation

presented. Subsequently, the results are presented independently, followed by a discussion on the future of these tools with more up-to-date data until 2020. Finally, the last section concludes with both definitive comments and potential research streams from the data analysis.

## Background

### The concept

Cryptocurrencies are a form of digital exchange that ensures that transactions are made through a robust encryption process, which, in turn, controls the number of stocks (Luu et al. 2016). This is a recent phenomenon gaining momentum in a volatile and fluctuating economic world (Ciaian et al. 2016) and has experienced significant growth, despite not being considered an official form of debt cancellation (Dwyer 2015). Due to the decentralized nature of cryptocurrencies, they cannot be used as a substitute for legal currency (Nakamoto 2008) even if they were created to be used as such, thus making them an unconventional currency. The creation and management of currencies are controlled by non-governmental entities (Kim 2015); hence, although they are considered a promising alternative for the future, they have various detractors who prefer to use them as a form of speculation (Baur et al. 2018; Krugman 2018; Zhang et al. 2021). The decentralized structure without regulated activity makes them a novel option to the traditional financial system (Franco 2014). Thus, although they start from a totally negative configuration, they have a series of advantages: cheaper transaction costs due to the absence of

intermediaries; reduction of transaction times as these are carried out via the Internet; the suppression of intermediaries as unnecessary financial agents in this series of transactions; or their globality (Kostakis and Giotitsas 2014; Koblitz and Menezes 2016).

In addition, individuals have freedom to develop this type of currency; consequently, multiple currencies have been created for specific purposes (Kondor et al. 2014) and have become standard payment mechanisms (Fabian 2016). They are used globally in a society that views its transactions between direct parties and perceives them as being more straightforward and negotiable because monetary conversion is not needed (Kristoufek 2013).

### Privacy and security

Originally, virtual currencies emerged as a means of digital exchange that guaranteed their security, integrity, and balance due to a higher level of protection created by users. In exchange for compensation, these individuals help with security work by processing algorithms (Van Alstyne 2014; Urquhart 2018). That is, the security mechanisms of this payment method arise from the users themselves who maintain and protect the base fabric by providing computing power (Böhme et al. 2015). Mathematically speaking, the security of an electronic currency or the blockchain can be compromised, but the cost required to achieve this would be high, depending on the algorithm and its creation protocol (Xu 2016; Khan and Salah 2018; Zhang et al. 2019).

Transactions carried out with these currencies are direct between users and generally anonymous (Miers et al. 2013), compared with those carried out with legal currency in which payments are made through banking networks. Therefore, anonymity has been a key factor since their very inception (Ober et al. 2013). Although the development of cryptocurrency has not always been equal and not all types of cryptocurrencies operate the same, the complexity of violating anonymity is equal to the breach of their security (Wang et al. 2018). Privacy and protection are mechanisms that, although considered strong, need to be improved to add new functionality as they progress in their use because their standardization makes them attractive to hackers (Conti et al. 2018; Feng et al. 2019).

### Blockchain setup and maintenance

Electronic currencies are created through mining, an incentive process in which transactions are verified and new units are created and added to the core of existing ones (Eyal and Sirer 2013). The miners are responsible for collecting the latest transactions into blocks and finding a solution to the algorithm of each currency. As a reward, a fixed amount of that currency is acquired by these miners (Böhme et al. 2015; Bonneau et al. 2015). The solution to the algorithm changes continually and depends on previous results to perform the next calculation in the sequence. This means that, as time goes by, the difficulty in finding a solution will become greater, and its cost increases (Eyal and Sirer 2013; Giungato et al. 2017). Thus, the process has been affected because the investment cost does not exceed the profits offered (Kristoufek 2015; Cocco and Marchesi 2016).

All the information related to the cryptocurrency is recorded on the blockchain, a digital book shared on the network and responsible for collecting all the transactions

carried out with the cryptocurrency in two parts (i.e., input and output) (Franco 2014). These exchanges or transactions are called blocks and are encoded and linked with others (Böhme et al. 2015). Blockchain information is stored on participating devices and is open access (Zyskind et al. 2015), making the exchange process transparent and immune to modifications (unalterable) (Brandvold et al. 2015). Once the data are verified, they can no longer be edited without the community's consent. This recent technology in cryptocurrencies can be used for multiple purposes (Sikorski et al. 2017; Kuo et al. 2017; Lee 2017) and is one of the most dynamic elements of the economy (Yin et al. 2017).

### Challenges

Due to the simplicity of use (Selgin 2013) and the lack of regulation, particularly concerning taxation (Follador 2017), virtual currencies have been linked to numerous unregulated activities, including criminal acts, and may contribute to further price distortion (Barratt et al. 2013; Hardy and Norgaard 2016; Foley et al. 2019; Griffin and Shams 2020). Another problem with these currencies is their high level of volatility, losses, and a lack of widespread acceptance among the general public, which could indicate their inefficiency (Nadarajah and Chu 2017; Klein et al. 2018). Although volatility can mean both a risk and an opportunity (Brière et al. 2013), it is an intrinsic part of the currency (Bariviera 2017) and virtually impossible to predict (Balciłar et al. 2017). Recent studies have found that short-term bubbles limit the ability to profit from these tools; however, investments in these currencies are not limited, leaving only conjectures about obtaining economic benefits (Li et al. 2018). The continuous variations and collapse in the exchange of distributed volume generate large fluctuations in prices (Navas-Navarro 2015; Polaski et al. 2015) that denote the inefficiency of this market (Urquhart 2016; Zhang et al. 2018; Neslihanoglu 2021). It is an exchange mechanism whose real value starts from zero (Van Alstyne 2014; Cheah and Fry 2015). Although their permanence is currently being discussed as a matter of general interest, research has posited that the life cycle of cryptocurrencies increases, as they stabilize (Bariviera et al. 2017).

### The market and the protocols

Many virtual currencies have currently been given a relative value, based on different variables, to the different legal tender currencies (Table 2). All belong to a version of

**Table 2** Digital Currency by market value (July 2021)

Position	Name	Market cap	Price	Shares in circulation
1	Bitcoin	\$750,600,171,509	\$39,959.72	18,770,200 BTC
2	Ethereum	\$271,733,293,394	\$2,325.39	116,889,042 ETH
3	Tether	\$61,828,690,396	\$1.00	61,796,971,748 USDT
4	Binance Coin	\$52,857,378,310	\$314.44	168,137,036 BNB
5	Cardano	\$41,218,509,234	\$1.29	32,065,792,346 ADA
6	XRP	\$32,843,217,941	\$0.7071	46,312,443,360 XRP
7	USD Coin	\$27,363,663,734	\$1.00	27,354,066,325 USDC
8	Dogecoin	\$26,668,380,056	\$0.2044	130,639,341,482 DOGE
9	Polkadot	\$14,779,410,550	\$15.10	979,197,585 DOT
10	Binance USD	\$12,228,250,268	\$1.00	12,224,571,047 BUSD

Source: Own compilation. Data collected from CoinMarketCap

the protocol, depending on their application. Thus, we find that Bitcoin uses version 1.0 of the blockchain, whereas other alternatives, such as Ethereum, use version 2.0. The latest version, called version 3.0, is part of an extension of the applications used. Bitcoin and Ethereum have been chosen as the most relevant currencies based on their original protocols, which share several characteristics, such as mining or their structure; however, differences also exist between them (Table 3).

Bitcoin is the pioneering platform of the blockchain concept based on a peer-to-peer exchange that does not rely on traditional transaction schemes in which central authorities or banks carry out transactions. Bitcoin can be defined as a form of cryptocurrency or payment system based on cryptographic evidence whose unit is bitcoin (Nakamoto 2008) and has unique characteristics that have defined the properties of these currencies (Phillip et al. 2018). Having evolved from the Blockchain 1.0 protocol, Bitcoin is currently the most valuable and central axis of cryptocurrency studies (Jang and Lee 2018). However, it has shared its weight with those of recent creation.

Meanwhile, Ethereum is an open-source, decentralized platforms whose purpose is to create the most significant smart contract agreements (Luu et al. 2016). It is a framework for the execution of contracts and useful automated computer applications (Bhargavan et al. 2016), without the need to trust third parties. It is currently considered one of the most complex networks under review. We have chosen to analyze Ethereum in this study because it is one of the pioneering and most stable cryptocurrencies 2.0.

### Research methodology

The bibliometric analysis is responsible for reviewing different bibliographic material to organize the relevant information on a specific topic. It is also a way of presenting scientific publications that seek to assess the status of a given topic and the quality and influence of authors and sources (Van Raan 2014).

**Table 3** Comparison between Bitcoin and Ethereum

	Bitcoin	Ethereum
Concept	Bitcoin is both a currency and a digital payment system	The Ethereum network is based on distributed ledger technology (DLT) or blockchain
Launch Date	31st of October 2008, date of publication of White Paper	December 2013
Form	Cryptocurrency	Cryptocurrency
Base	Blockchain	Blockchain
Ticker	bitcoin (BTC)	ether (ETH)
Purpose	Payment System	Allows execution of Smart contracts Contracts and decentralized applications by means of writing lines of code
Design	Virtual Currency	Token
Supply	Mining Recompense is based on validation of blocks	Mining Validation of blocks, transactions or contracts
In circulation	21 million bitcoin in total	18 million per year
Other	Used like any other fiat currency	Includes supplementary fees for "gas" Only works within its own network

Source: Own compilation

For the elaboration of the present study, we have followed a series of systematic stages. First, we established a list of research questions oriented for this study, which helped delimit the most important words, the search pages, and the chosen period, marking the direction of the work. Once the main theme had been structured and created, the first results were filtered, delimiting the research toward a total number of 1455 scientific articles distributed among the WoS and Scopus databases. With the obtained metadata, we then proceeded creating our own database which has been used for the present analysis.

### **Research questions**

We formulate research questions that can help us identify the volume of articles to predict future patterns and determine future lines of work to focus on. These questionnaires will also make us easier to determine which papers and publication venues to publicize our research. Lastly, these questions will help establish the relevance of the field at a general level and help find possible new funding or coordinated research avenues among the agents involved. We thus present the following research questions:

*Q1:* What is the distribution of publications on cryptocurrencies, especially Bitcoin and Ethereum, in relation to their citations?

*Q2:* What areas of publications have the highest impact?

*Q3:* Which articles are the most influential in this technology according to the number of citations, and where are they located?

*Q4:* Which are the most relevant and related countries and institutions?

### **Data extraction**

This study analyzed cryptocurrency, and the sources are the WoS and Scopus databases that include the largest number of academic journals and publications. It also analyzes the most frequently published authors, the most common or relevant topics, the number of publications by country, and the language used for the largest number of publications.

Two noteworthy sources have been chosen to solidify their documentary strength (Manterola et al. 2005). This study's validity study depends on whether the subject area or the topic being researched is included in the sources of information. For many years, WoS was the only database designed as an international and multidisciplinary tool. Subsequently, Scopus was developed to compensate for the limitations of its predecessor, and to date, it is a more extensive database.

Based on several assumptions, the analysis is structured as follows: First, the parameters of the study were chosen or defined to select the appropriate databases from which to extract the data. Second, the corresponding search criteria were adjusted, and the bibliographic information categories were compiled. Finally, the extracted material was coded and used to create a combined database, and the extracted data were analyzed and contrasted.

The words selected for the search were "cryptocurrency," "Bitcoin," or "Ethereum." This selection covered both the generic concept of electronic currency and the two types of pioneering and best-known currencies in the protocol's respective version. The

period selected was from 2010, the date of the first publication, to 2018, using the years 2019–2021 to check whether the published articles influenced future research trends. This is because, looking at all the data, we determine a turning point at which publications begin to double the number of the previous year (Fig. 1). From the aforementioned search criteria, we selected the filter for scientific articles as these were considered to be the most representative.

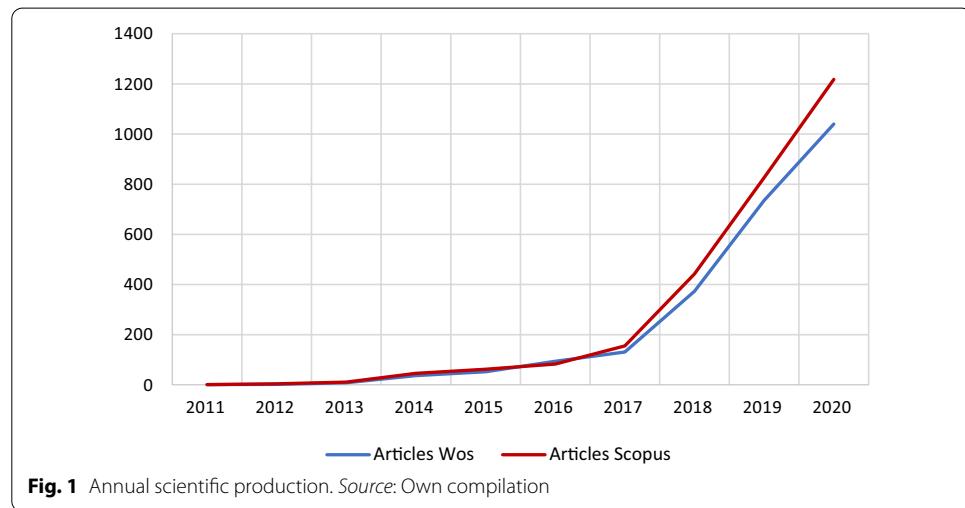
#### Documents selection and data analysis

We have used three different indicators for the selection of documents: quantity, quality, and the structural form and the relationship between publications. Quantity shows the productivity index in terms of the number of publications. Meanwhile, quality shows which publications have the greatest impact according to the total number of citations received by a given text. Of the three, the two central ones of this text will be quantity and quality. These lead to the development and identification of successive rankings that will be displayed in various tables.

After selecting the documents to be used, we created three databases, that is, an individual one for each platform for comparison and a common unified one for specific analyses. For this, we have used three software packages: Tableau, R (Bibliometrix R Package), and VOSviewer.

The coding process was conducted by building a database using different variables that store information about each article, thereby extracting the productivity related to this research field.

Finally, after selecting the questions and extracting and preparing the data, we conducted an analysis consisting of the number of publications and their incidence, a selection of research areas, a distribution by country, institutions and journals, a more detailed section dedicated to their authors, and a summary of the trends.



## Results

To achieve a global view of the productivity in this field of research, this study's results encompass the articles published during a given period and include information about their respective languages, countries, institutions, journals, and authors. As we have mentioned, the WoS and Scopus database search applies from 2010 to the end of 2018 because from 2019 onwards, the number of publications has multiplied, especially those related to the term blockchain, which may mislead the results (Fig. 2).

### Initial approach

The following data show the evolutionary state of the cryptocurrencies up to the present. As mentioned, the referenced sources are the WoS and Scopus databases, in which WoS is considered the pivotal source because of its greater seniority.

The first section analyzes the sample. Applying the corresponding search filters, we found 684 documents on the WoS database and 771 items on Scopus. Of these combined results, 407 documents appeared in both databases. The search in the two databases utilized the same period and began receiving content relevant to this study at almost the same time. Although the search is delimited by years, we focus on the starting year 2010 because of an anomalous result in Scopus in 1952 that coined the term Ethereum in an investigation by Dr. H. Greiner in the area of medicine. After excluding this search result, both bases coincide in the date of publication of articles, thus establishing this criterion equally.

Publications that included keywords, such as "Bitcoin," "Ethereum," or "Cryptocurrency," appeared in 2011. Thereafter, the number of publications that included these keywords doubled annually. The recent creation of the aforementioned cryptocurrencies and their low impact indicate no related publications during the first years. Since 2011, when a single publication appeared in both databases, the results have

BITCOIN AND BEYOND: A TECHNICAL SURVEY ON DECENTRALIZED DIGITAL CURRENCIES	BITCOIN MEETS GOOGLE TRENDS AND WIKIPEDIA: QUANTIFYING THE RELATIONSHIP	ON THE HEDGE AND SAFE HAVEN PROPERTIES OF BITCOIN: IS IT REALLY MORE THAN	HEDGING	VOLATILITY	THE	PRICE
BITCOIN: ECONOMICS, TECHNOLOGY, AND GOVERNANCE	BITCOIN, GOLD AND THE DOLLAR - A GARCH VOLATILITY ANALYSIS	THE DIGITAL TRACES OF BUBBLES: FEEDBACK	THE IOT ELECTRIC BUSINESS MODEL: USING	SOME STYLIZED FACTS OF THE BITCOIN MARKET		CAN VOLUME PREDICT BITCOIN RETURNS AND
THE INEFFICIENCY OF BITCOIN	WHAT ARE THE MAIN DRIVERS OF THE BITCOIN PRICE? EVIDENCE FROM	THE INEFFICIENCY OF BITCOIN REVISITED: A	FAIRACCESS: A NEW		PRICE	
SPECULATIVE BUBBLES IN BITCOIN MARKETS? AN EMPIRICAL INVESTIGATION INTO THE FUNDAMENTAL	THE ECONOMICS OF BITCOIN AND SIMILAR PRIVATE DIGITAL	EXPLORING THE DYNAMIC RELATIONSHIPS	BITCOINS AS AN INVESTMENT OR	DIFFICULTY CONTROL FOR		DOES BITCOIN HEDGE GLOBAL
	ON THE INEFFICIENCY OF BITCOIN	DO THE RICH GET RICHER? AN EMPIRICAL		BLOCKCHAIN BASED		

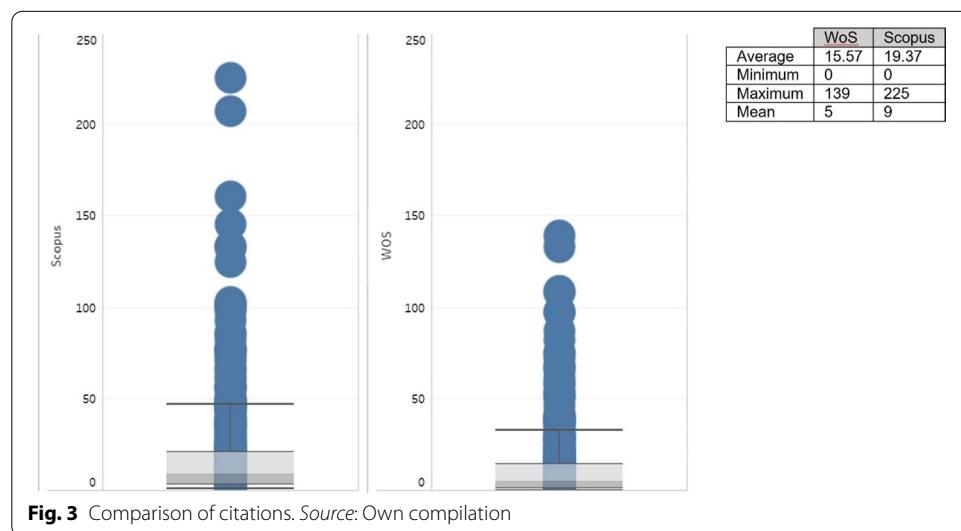
**Fig. 2** Most Cited articles in both databases. Source: Own compilation

increased exponentially. Figure 2 highlights that the trajectory followed by both databases is similar in terms of total publications, although with internal differences. If the set of publications is analyzed, Scopus includes a larger number than WoS, except for 2016, in which this trend is reversed.

The first publication included in WoS is “On Bitcoin and Red Balloons” (Babaioff et al. 2012), which talks about getting a reward in a node “competition.” Meanwhile, on Scopus, the first article is “Bitcoin: A bit too far?” (Jacobs 2011), which deals with issues internal to the currency. Although both publications received a low number of citations, the article “Bitcoin: A bit too far?” obtained a total of 10 citations compared to the two citations received by the article on WoS.

In terms of citations on both platforms, the most significant articles practically coincide, making it more relevant even with the creation of a common database that combines both sources (Fig. 2). In a separate analysis, both databases would show concordance in two of the three articles. Moreover, both articles would be in WoS and Scopus, although in different ranking positions. The article “Bitcoin: Economics, Technology, and Governance” (Böhme et al. 2015) is ranked first in WoS with 139 citations, whereas in Scopus, it is ranked third with a total of 207 citations. The article that ranked second on WoS is “Bitcoin and Beyond: A Technical Survey on Decentralized Digital Currencies” (Tschorisch and Scheuermann 2016), with 133 citations; however, this article is ranked first in Scopus, with a total of 225 citations. Meanwhile, the article “Where is current research on Blockchain technology?—A systematic review” (Yli-Huumo et al. 2016) ranks second on Scopus, with a total of 210 mentions, but it did not have any citations on WoS. Finally, the third-ranked article on WoS, that is, “Speculative bubbles in Bitcoin markets? An empirical investigation into the fundamental value of Bitcoin” (Cheah and Fry 2015), has 109 citations.

Apart from the articles ranked first, the number of citations on Scopus is higher than on WoS (Fig. 3). The average number of citations per article is also higher, that is, 19 on Scopus compared to 15 on WoS, even though WoS contains a larger number of documents on the topic. Although both databases commence with articles



**Table 4** General view

Year	A		Au		C		J		TC	
	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco
2011	1	1	4	1	1	1	1	1	2	9
2012	2	4	2	4	1	1	2	4	32	52
2013	8	10	9	18	9	6	8	9	253	296
2014	37	44	33	76	14	21	21	36	245	489
2015	52	62	97	117	22	25	48	54	863	782
2016	87	81	166	159	33	35	70	66	1102	1129
2017	132	148	288	159	37	39	101	105	1193	860
2018	365	421	892	160	65	69	212	159	1258	623

A = Articles, Au = Authors, C = Country, J = Journals, TC = Total cites. Source: Own compilation

**Table 5** Distribution by research area

RW	A	RC	A
Economics	156	Computer Science	269
Business finance	125	Economics, Econometrics and Finance	217
Computer science information systems	96	Social Sciences	188
Law	62	Engineering	166
Engineering electrical electronic	43	Business, Management and Accounting	133
Telecommunications	43	Mathematics	70
Computer science theory methods	42	Materials Science	39
Computer science software engineering	40	Decision Sciences	33
Multidisciplinary sciences	38	Biochemistry, Genetics and Molecular Biology	31
Computer science interdisciplinary applications	28	Arts and Humanities	29
Computer science hardware architecture	24	Physics and Astronomy	28
Business	22	Multidisciplinary	20
Physics multidisciplinary	20	Agricultural and Biological Sciences	16
Management	14	Energy	16
Remaining areas	209	Remaining areas	68

RW = Research area WoS, RC = Research area Scopus, A = Articles. Source: Own compilation

without citations, the ends of the diagram show a greater number of atypical results in Scopus.

As can be seen, the results are quite similar, both being in an equal position. The country variable in both also shows a homogeneous growth and with similar results. The most significant distinction can be found in the total number of citations if the results are distributed over the years with a significantly higher number of citations on WoS. This is because although the number of articles is lower, the variables of authors and journals are higher (Table 4).

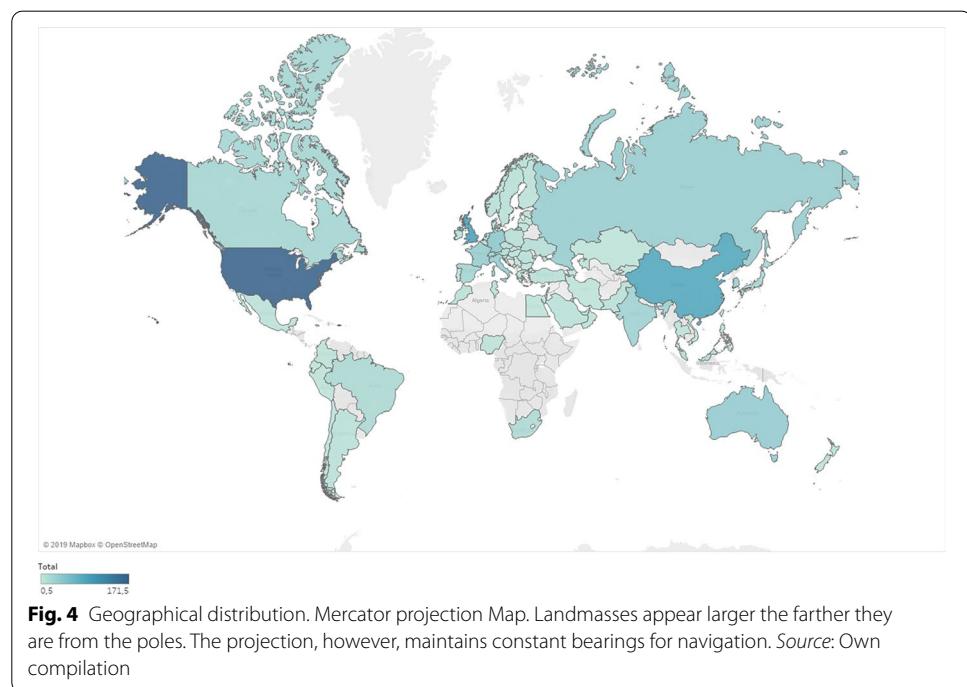
#### Distribution by area of research

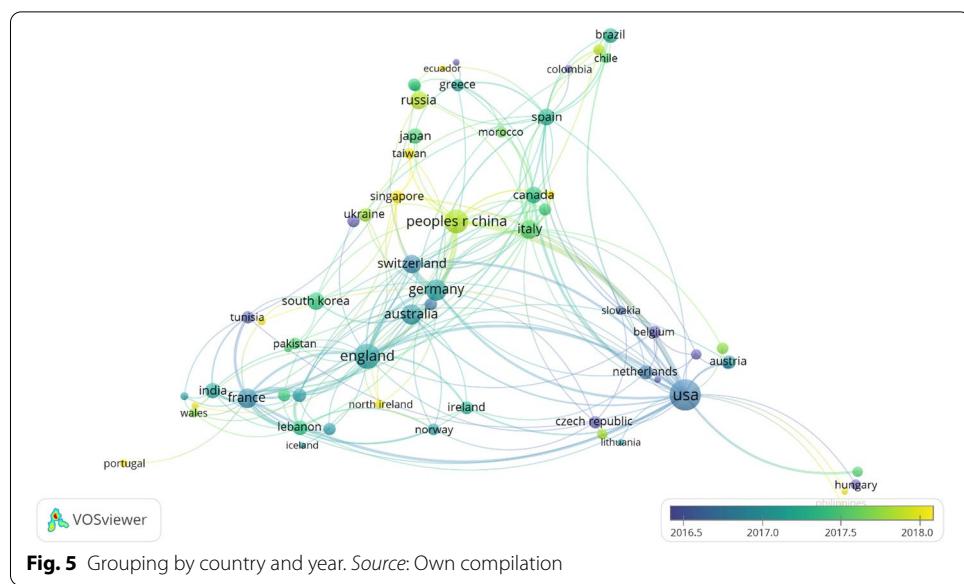
When comparing the databases, our search results show that the main areas of knowledge are information technology and economics (Table 5). Although WoS had 100 fewer

results when the same number of research areas were considered, the wide range of classified thematic areas contained within WoS is greater than the classification in Scopus, and thus the articles are distributed across a wider range of subjects.

Using WoS as a reference, we use areas of economic knowledge, such as economics and business finance, in the ranking. The total sum of these articles is 282, which is similar to the second category in Scopus, which encompasses Economics, Econometrics, and Finance. The remaining positions in the ranking are related to computer science, systems, and telecommunications, almost half of those included in the list. The remaining articles are distributed among multiple categories, that is, a total of 76 different research areas include the terms Bitcoin, Ethereum or Cryptocurrency, although only 14 of these are specifically listed in the table. In contrast, Scopus directly links computer-related articles and ranks them first. Next, the economic and social sciences are ranked second and third with the remaining articles being linked, to a greater extent, to computer sciences, such as engineering and mathematics; and the social sciences with business and management. Once the threshold of the eighth theme is crossed, a greater diversity of topics begins to be seen.

The results of both the databases and the many thematic areas denote the wide variety of applications that technologies derived from electronic currencies have. Although the keywords are based on economics, the standardized use of technologies born from cryptocurrencies, most notably digital ledgers or blockchain, means that the distribution of themes is very widespread. The blockchain shows a positive evolution in databases, such as WoS, with a total of 692 results solely in articles in a period of just three years. The term “blockchain” did not receive citations until 2015, the year in which its development really took off. Hence, its importance is evident when compared to the origins in Bitcoin, because it has managed to equal the same number of articles in half the number of years.



**Table 6** Distribution by country

C	R		A		TC		H	
	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco
USA	1	1	182	161	1249	865	17	21
UK	2	3	84	91	1035	806	16	23
China	3	2	74	97	358	320	9	13
Germany	4	4	43	38	416	399	10	13
Australia	5	8	39	31	361	312	12	14
France	6	10	36	29	425	227	12	12
Italy	7	7	32	33	210	128	8	9
Switzerland	8	11	29	23	217	190	8	8
Russia	9	5	25	38	27	65	2	6
South Korea	10	9	23	31	136	175	7	8
Canada	11	12	22	19	70	79	5	8
Spain	12	13	22	19	350	235	8	10
India	13	6	17	33	105	63	5	7
Japan	14	15	15	16	51	42	4	5
Brazil	15	14	13	16	21	29	3	3

C=Country, R=Position in the Ranking, A=Articles, TC=Total cites, H=H-Index. Source: Own compilation

### Distribution by country

In terms of geographical distribution, an apparent growing trend toward research on this topic originates from the Asian continent, apart from the time factor (Figs. 4 and 5). That said, the principal language used is still English, and virtually all articles appear in the two databases published in this language. Other articles were published in Russian, Spanish, and Turkish in WoS, whereas the most used languages were Chinese, Russian, and German in Scopus. Note that although both databases consider Russian to an influential language, as a geographical region, Russia is not featured as one of the most influential countries in terms of the number of publications.

In a more detailed comparison, both databases show similar results with respect to the first four and the last two ranked countries (Table 6). Both databases show the USA, UK and China leading the ranking. These countries also account for the largest number of articles and citations together with the highest H-indexes. The databases also coincide with respect to the countries ranked last, with the possible exception of India, which in Scopus, is ranked sixth. Specifically, considering the ranking in terms of the number of articles published, the results from both databases practically coincide, whereas the results are more disparate in terms of the total number of citations. The discrepancy mentioned earlier in India can only be highlighted in the number of articles. Regarding the total number of citations, the rankings of Russia and Spain stand out for different reasons. In the case of Russia, the total number of citations is much lower than expected given the number of articles published. In contrast, Spain obtained a number of citations that would place it in several higher positions compared to the number of published articles; the h-index is clearly higher than that obtained in the classification.

If we develop the content dealt with in each country in a more important way, taking a total of 5 words as the focus of studies, we can see how the USA has always studied bitcoin, deriving from it the concept of currency, blockchain, innovation, and economy together with security. For its part, and also taking bitcoin as a central focus, England has added the volatility of these currencies together with their technology, such as blockchain, to its most relevant words. China is next, giving the same importance to bitcoin as to the blockchain, deriving two lines of research from which the main concern of bitcoin comes from its inefficiency and prices; however, the blockchain mentions security and smart contracts. Germany and Australia are next on the list, but the main focus is on bitcoin, but it is much shorter in terms of secondary issues, just mentioning economics and blockchain. Meanwhile, Russia remains with bitcoin and cryptocurrencies in general and, if the number of keywords is lowered as a concurrence, China appears as another result, being the only ones to mention another place directly.

### **Institutions**

The most pivotal institution related to electronic currencies that focuses on Bitcoin and Ethereum is the University of London with a total of 24 and 14 articles in WoS and Scopus, respectively (Table 7). This institution is followed by PDX Currency Corp in WoS, with 17 published articles, although no citations are related to them. Again, in terms of number of published articles, the next ranked institutions are the University College London with 14 articles and Eidgenössische Technische Hochschule Zürich (ETH Zurich) and the University of California System with 13 articles each. They have also attracted a large number of citations. Except for ETH Zurich, the aforementioned institutions are all English-speaking, which coincides with the high number of publications in that language.

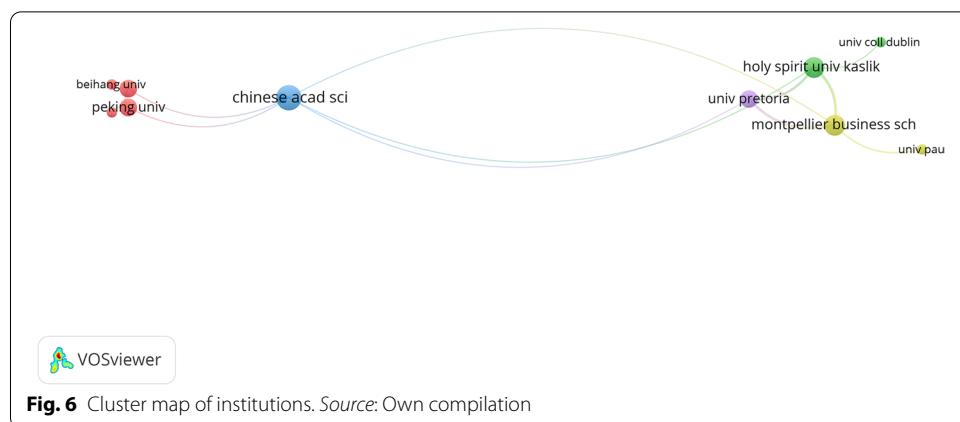
In contrast, Scopus shows a greater spatial distribution with respect to institutions. Although the first result coincides with the aforementioned results from WoS, the institutions appearing next in the ranking are Montpellier Business School, Chinese Academy of Sciences, ETH Zurich and Holy Spirit Univ Kaslik located, respectively, in France, China, Switzerland and Lebanon. The articles published by these institutions have a higher number of references compared with more prominent institutions listed in WoS.

**Table 7** Institutions

I	R		A		C		TC		AC		H	
	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco
University of London	1	1	24	14	UK		162	73	6.75	5.21	7	6
PDX Currency Corp	2	–	17	–	USA	0	–	0	–	0	–	–
University College London	3	–	14	–	UK	74	–	5.29	–	4	–	–
ETH Zurich	4	4	13	9	Switzerland	147	158	11.31	17.6	4	5	5
University of California System	5	–	13	–	USA	105	–	8.08	–	4	–	–
Holy Spirit Univ Kaslik	–	5	–	9	Lebanon	–	117	–	13	–	8	8
Montpellier Business School	6	2	12	12	France	254	132	21.17	11	7	9	9
Beihang University	–	6	–	8	China	–	20	–	2.5	–	3	3
Languedoc Roussillon Universites Comue	7	–	11	–	France	251	–	22.82	–	7	–	–
University of Pretoria	–	7	–	8	South Africa	–	61	–	7.63	–	6	6
Chinese Academy of Sciences	8	3	10	11	China	49	158	4.9	14.36	5	6	6
Xidian University	–	8	–	8	China	–	17	–	2.13	–	3	3
University of Manchester	9	–	9	–	UK	117	–	13	–	4	–	–
Imperial College London	–	9	–	7	UK	–	28	–	4	–	4	4
Centre National de la Recherche Scientifique Cnrs	10	–	8	–	France	20	–	2.5	–	3	–	–
Ku Leuven	–	10	–	6	Belgium	–	63	–	10.5	–	4	4

Source: Own compilation

I=Institution, R=Position in the Ranking, A=Articles, C=Country, TC=Total cites, AC=Average citation, H=H-Index



The results show that WoS has a greater concentration of English and American institutions as a central pillar, bringing together a core of English-speaking institutions that makes up 40% of the total. In contrast, Scopus has a more varied distribution. The central focus of the five institutions of each essential database has always been on issues related to bitcoin as a core, with publications on its volatility, hedge, and economics deriving from it. In a more minor way this time, the concept of the blockchain appears. To conclude this section, we created a cluster map of institutions. As suggested by Fig. 6 and given the recent development of the topic, the links and relationships between institutions are scarce, with only a suggestion of a rapprochement between Asian entities.

### Journals

The journals with the highest number of publications in WoS and Scopus are *Economics Letters* and *IEEE Access* with a total of 29 and 28 publications, respectively in the case of *Economic Letters* and 26 and 30 in the case of *IEEE Access*. They both clearly have a high H-Index along with a large total number of accumulated citations. Two sources appear in the third position of the ranking of both databases, albeit without any associated citations. They are *Digital Currency Challenge Shaping Online Payment Systems* through US Financial Regulations and *Economist United Kingdom* with 17 and 21 articles, respectively from USA and UK. This phenomenon of not receiving any citations is repeated in the WoS ranking with the fourth ranked journal, *Palgrave Pivot*, and in Scopus with the seventh ranked journal, *Technology Review*.

In the sample provided, only five journals are considered global publications in Table 8 for both databases. This is evidence of the disparity between the two sources because, aside from the two journals mentioned in the previous paragraph, *Finance Research Letters*, *PLOS One*, and *Physica A: Statistical Mechanics and its Applications* are the only journals listed in both sources. Although there are no other concurrences, the basic scheme observed is remarkably similar because the coincident entities do so in almost an equal number of the ranking, whereas the remaining journals coincide approximately in the number of articles. The number of publications in these journals is always related to economics, inefficiency, volatility, and gold, leaving blockchain and security as secondary topics.

**Table 8** Distribution by Journal

J	R		A		JCR		SJR		C		TC		AC		H	
	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco
Economics Letters	1	2	29	28	0.876	0.767	Switzerland	721	377	24.86	13.46	13	16			
IEEE Access	2	1	26	30	4.098	0.609	USA	111	63	4.27	2.1	7	10			
Digital Currency Challenge Shaping Online Payment Systems through US Financial Regulations	3	—	17	—	—	—	USA	0	—	0	—	0	—			
Economist United Kingdom	—	3	—	21	—	0.100	UK	—	0	—	0	—	—	0	—	
Palgrave Pivot	4	—	17	—	—	—	USA	0	—	0	—	0	—	0	—	
Finance Research Letters	5	4	14	14	1.709	0.770	USA	405	242	28.93	17.29	9	11			
PLOS One	6	5	14	14	2.776	1.100	USA	219	319	15.64	22.79	7	10			
Physica A: Statistical Mechanics and Its Applications	7	6	13	13	2.5	0.699	Netherlands	113	61	8.69	4.69	4	7			
Technology Review	—	7	—	9	—	0.117	USA	—	0	—	0	—	0	—	0	
ERCIM News	8	8	—	—	—	—	—	1	1	0.13	—	1	—			
Computer	8	—	8	—	—	0.498	USA	—	61	—	7.63	6	—			
Journal of Risk and Financial Management	9	—	8	—	—	—	—	27	—	3.38	—	3	—			
Royal Society Open Science	—	9	—	8	—	1.131	UK	—	25	—	3.13	—	2	—		
Ledger	10	—	8	—	7	0.177	—	7	7	0.88	—	2	—			
Computer Fraud and Security	—	10	—	7	—	—	—	—	36	—	5.14	3	—			

Source: Own compilation

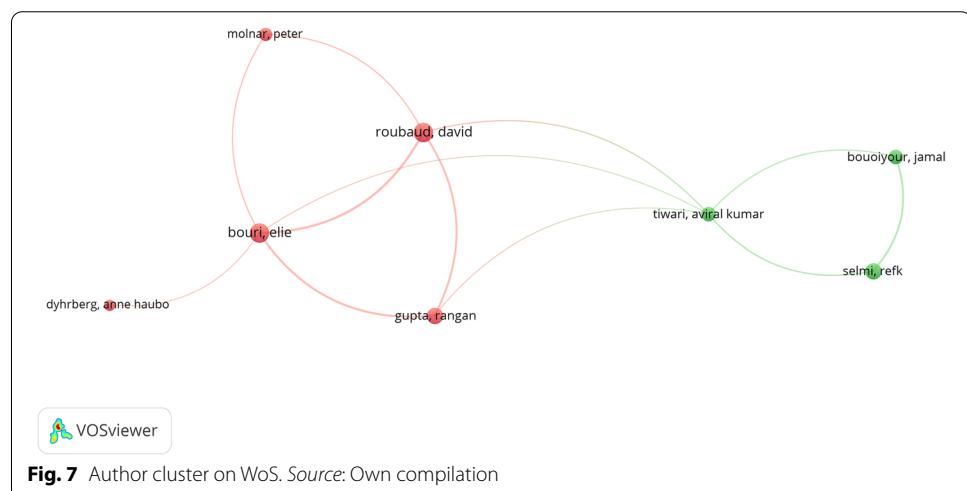
J=Journal, R=Position in the Ranking, A=Articles, JCR=Journal Citation Reports, SJR=Scimago Journal Rank, C=Country, TC=Total cites, AC=Average citation, H=H-Index

**Table 9** Distribution by author

Au	R		A		TC		AC		H		FP	LP
	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco	WoS	Sco		
Mullan, P.C.	1	–	17	–	0	–	0	–	0	–	2014	2014
Bouri, E.	2	1	9	9	223	117	24.78	13	7	8	2017	2018
Roubaud, D.	3	2	9	9	242	131	26.89	14.56	7	8	2017	2018
Androulaki, E.	4	–	7	–	29	–	4.14	–	1	–	2015	2016
Gupta, R.	5	3	7	6	116	60	16.57	10	5	6	2017	2018
Luther, W.J.	6	5	7	5	76	39	10.86	7.8	5	4	2016	2018
Wang, J.	7	–	7	–	36	–	5.14	–	3	–	2018	2018
Bouoiyour, J.	–	7	5	4	70	37	14	9.25	5	4	2015	2018
Karame, G.	8	–	6	–	0	–	0	–	0	–	2016	2016
Corbet, S.	–	8	–	4	–	27	–	6.75	–	3	2017	2018
Marchesi, M.	9	4	6	6	41	22	6.83	3.67	4	4	2017	2018
Li, X.	–	9	5	4	43	4	8.6	1	3	3	2017	2018
Selmi, R.	10	6	6	5	71	37	11.83	7.4	5	4	2015	2018
Liu, J.	–	10	–	4	–	4	–	1	–	2	2017	2018

Source: Own compilation

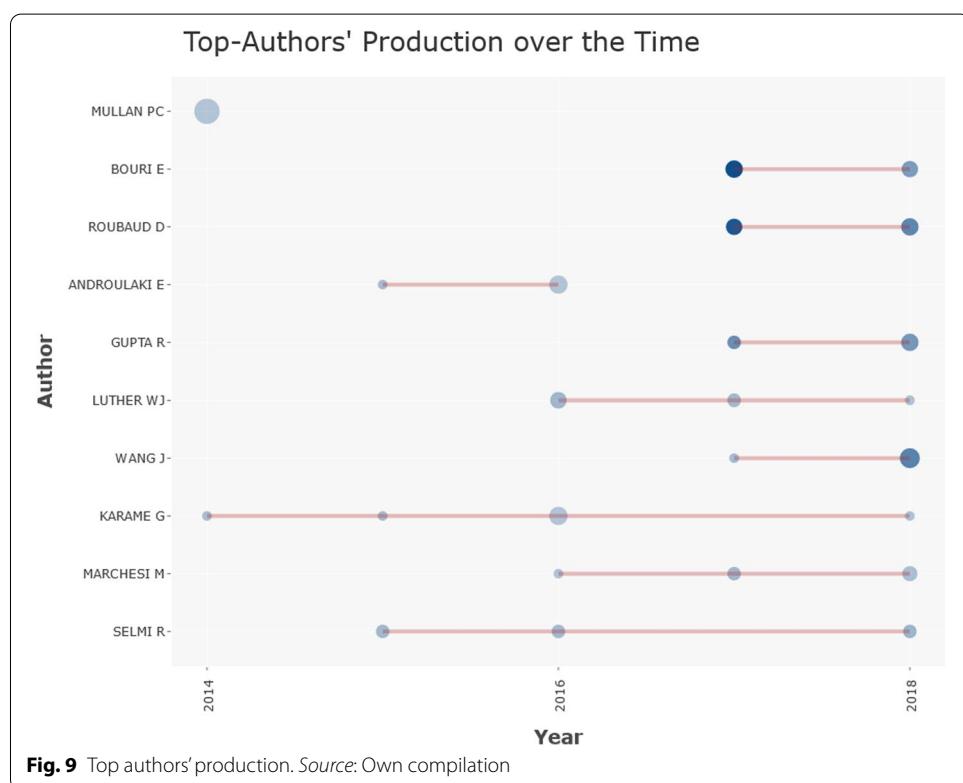
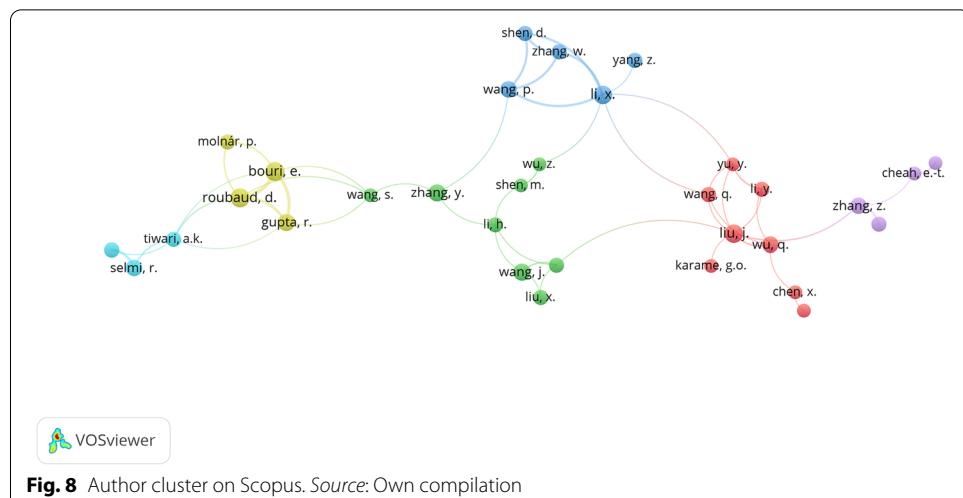
AU = Author, R = Position in the Ranking, A = Articles, TC = Total cites, AC = Average citation, H = H-Index, FP = First publication, LP = Last Publication



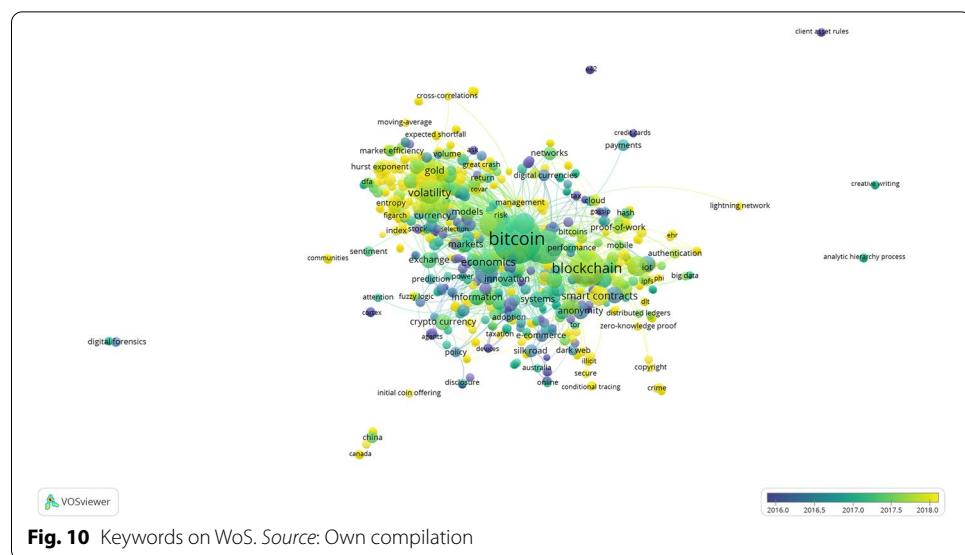
## Authors

As a final comparison, Table 9 shows the authors ordered according to the index of publications on the topic. The 17 articles by P.C. Mullan, which appear solely in WoS, can be highlighted as an anomalous result, as they have received no citations. This can be linked to the previous section on publications, as these articles are contained in a manual. Regarding the rest of authors, E. Bouri and D. Roubaud stand out with nine articles each, published in 2017 and 2018. Both authors have collaborated extensively and had many citations, well above the average of other authors, although not in all articles.

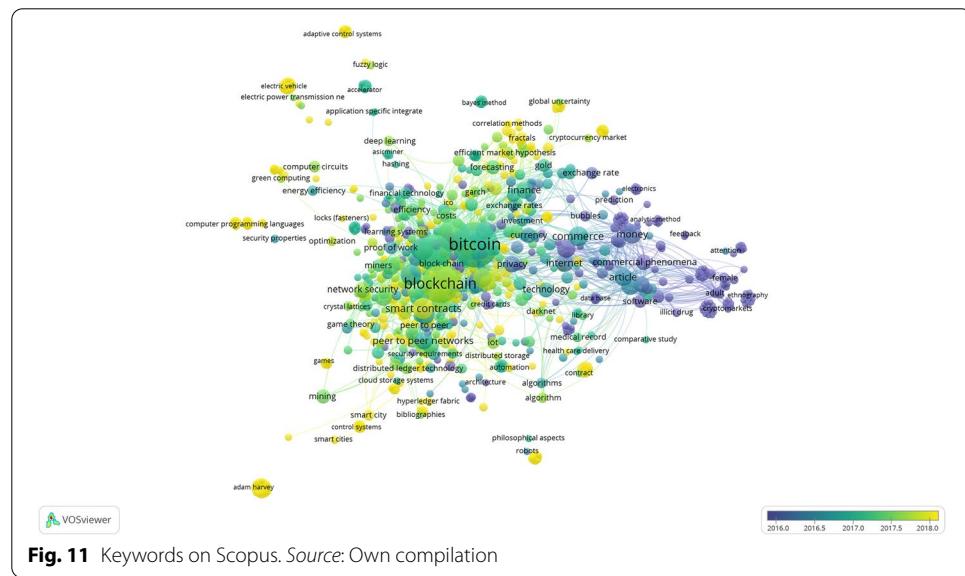
Based solely on the total number of publications, and focusing on the most influential authors, the distribution of authors in both databases is quite similar. Regarding



the field to which the authors belong, the most important ones come from Business & Economics, Computer Science and Environmental Sciences & Ecology. However, in a cluster analysis (Figs. 7 and 8) and using the two databases as the basis for the analysis, we determine that the relationship between them changes. In both cases, the grouping has been generated using the same basic parameters that, together with the greater distribution among the Scopus institutions, shows broader results with six central nuclei versus the two mere nuclei in WoS.

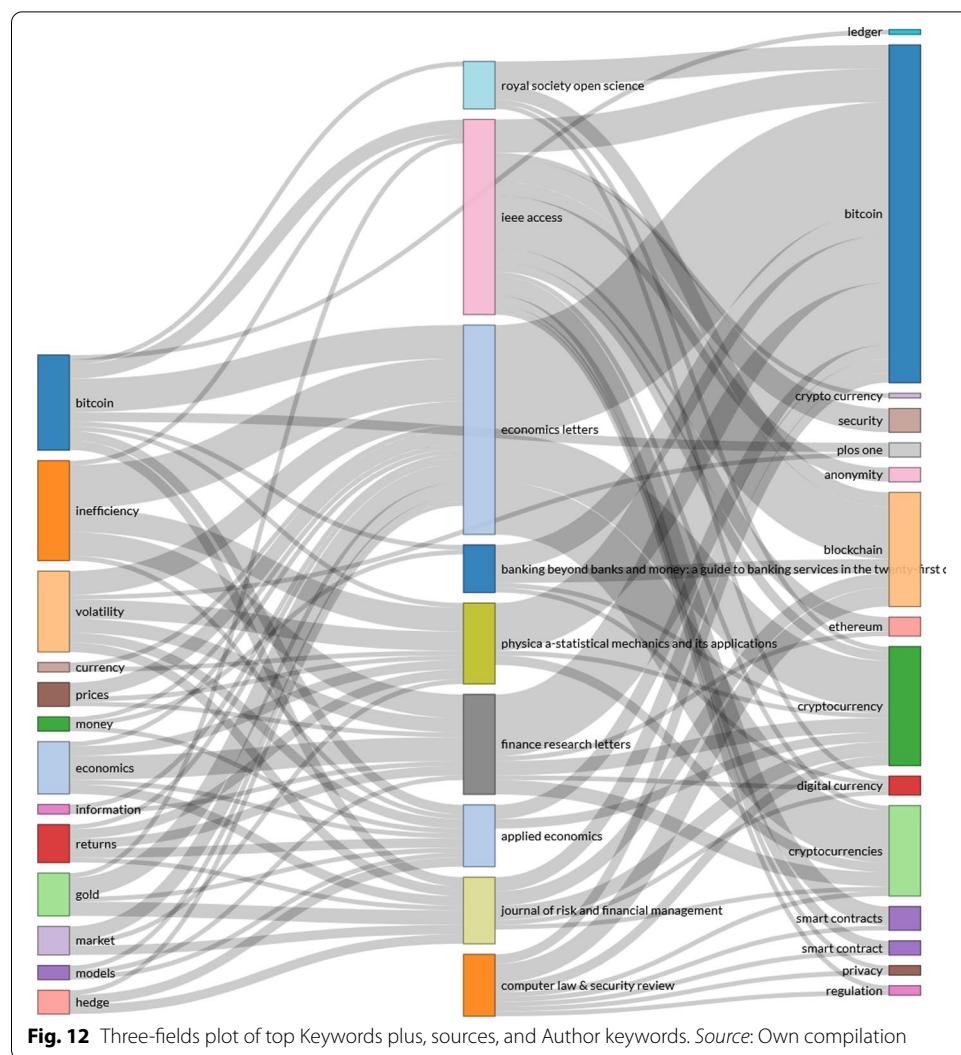


**Fig. 10** Keywords on WoS. Source: Own compilation



**Fig. 11** Keywords on Scopus. Source: Own compilation

Figure 9 shows the evolution of the scientific production achieved by the most relevant authors, taking WoS as a reference to observe their trajectory. The circles on the cluster map represent the number of articles, and the color represents the intensity of the citations received during the year. This would show how the most important publications were produced in WoS during 2017, coinciding precisely with the beginning of the increase in scientific publications.



**Fig. 12** Three-fields plot of top Keywords plus, sources, and Author keywords. Source: Own compilation

### Trend analysis

Based on the content of all the articles, we can identify the most common terms and those with the greatest impact related to electronic currencies. Using the VOSviewer software and R (Bibliometrix package), we compiled a series of large clusters indicating the frequency and evolution of the keywords (Figs. 10 and 11), combined with a three-field plot of top Keywords Plus, Sources, and Author Keywords (Fig. 12). Notably, the wide variety of terms in Scopus is due to a higher index of publications, even if some of them have not been followed up.

The results of both graphs show similarities in terms of key concepts that are maintained over time. The secondary issues continue to have Bitcoin as the central focus, drifting toward the concepts of blockchain, money, and security. Remarkably, although the term Ethereum has been used as a study keyword, it does not appear directly in the cluster figures, although the derivative terms, such as Smart contracts, appear as the purpose of this type of currency.

The concept of security appears directly related to electronic currency, and hence, the fact that it is not reflected in any type of legal regulation is conspicuous, given the complexity of these payment mechanisms. If the latest publications and texts taken from conferences are incorporated, changes are made to the graph that had not been previously considered, such as security becoming an impactful mainstay of the topic. This is due to the standardization and greater acceptance of these types of currencies that had even been temporarily banned in countries, such as China (2019), which is now one of the largest producers of articles related to the subject, coming to appear in the keywords of both databases, although the current situation in China is complex, as its uses have recently been limited (China 2021).

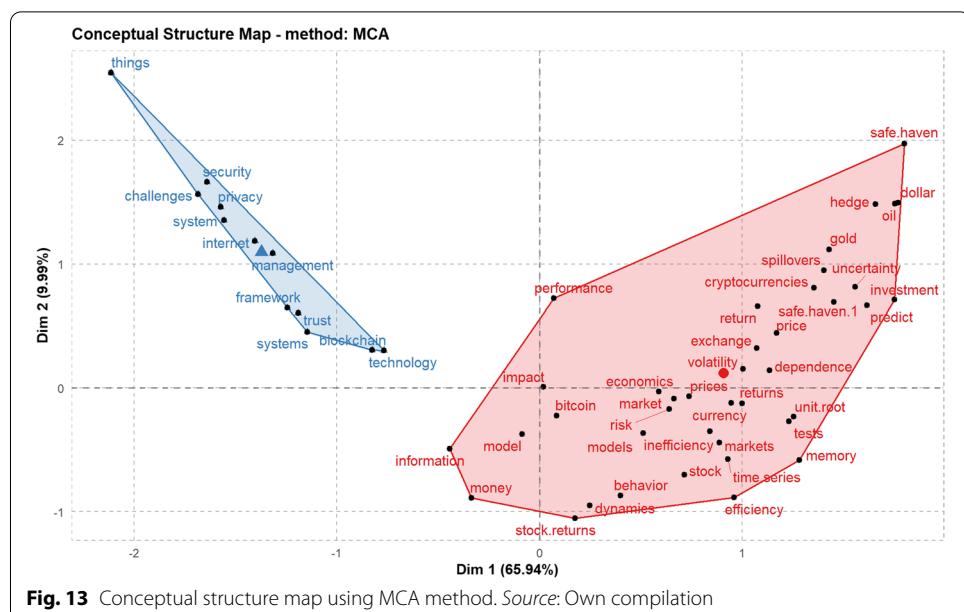
Returning to the concept of security, we determine that the term crime appears close due to the increase in publications related to criminal acts, such as money laundering processes, darknet shops, or payment to ransomware, that in the last three years has doubled the number of publications (Turner et al. 2019; Albrecht et al. 2019). This terminology is related to the illicit and dark web keywords that evolve from the concept of anonymity.

To finish with the new trends section, we compiled a Sankey diagram (Fig. 12). The diagram shows the relationship between sources (center), Keywords Plus (left), and Author Keywords (right), which is especially useful for locating the topic in each of the journals (Riehmann et al. 2005). The size of the nodes represents the frequency of the item and the lines show the connections between them. The use of Keywords Plus and Authors' keywords shows a difference to be considered, as Keywords Plus are more effective than words given by authors in bibliometric analyses even if they are less representative of the article's content. (Zhang et al. 2016).

We can argue that *Economics Letters* relates its publications to a greater number of terms, such as inefficiency, volatility, or market, covering more topics or characteristics because of connector flows. These are in turn closely related to the words "electronic currencies, bitcoin and smart contracts" as the authors' keywords. Therefore, although this first node mentions more topics, they are all related to the economic world, leaving in the background the importance of applied technologies, such as blockchain. The publications of the second most influential node, *IEEE Access*, are closely related to the concepts of "inefficiency, Bitcoin, and volatility," with special interest in the authors' words "bitcoin, security, blockchain, smart contracts, privacy and privacy regulation." Therefore, the authors of these publications can focus more on the financial applications that arise from blockchain networks than on developing the currencies themselves. This perspective seems to be shared by four other sources (i.e., *Computer Law & Security Review*, *Journal of Risk and Financial Management*, *Banking Beyond Banks and Money*, and *Royal Society Open Science*), whereas *Applied Economics and Finance Research Letters* follow the trend of the first node.

## Discussion

Using 2020 as a deadline, we can see that the aforementioned trends are the ones that have finally concentrated on these publication types. The conceptual structure map (Fig. 13) of the MCA keyword plus method shows two main clusters in different colors that coincide with the driving themes of these publications (Fig. 14). This word



clustering allows us to identify from today the groups with the same meaning and their relationships. Porter's derivation algorithm has been used to reduce the number of words used in a root form, but this time, from the authors' keywords with similar results. In both cases, a maximum of 250 words per term has been applied. Both show that regardless of the analysis used and keywords, the central topics are Bitcoin and the blockchain network, which creates and supports the need for a separate bibliometric review of different areas to check the trends in them in the future. This situation is repeated in the different analyses conducted on the subject regardless of the basis used, clearly showing a separation between technology and economy (Merediz-Sola et al. 2019; Shen et al. 2020).

Figure 15 shows a thematic division into four different periods. This is conducted to clarify how the same area has been clearly divided into two distinct interconnected branches since 2017–2018, creating the aforementioned economic-technological division. Although the concern for cryptocurrencies is related to their value in the market, technological evolution has opened up new lines of research thanks to its multiple applications, such as machine learning.

At this point, some questions arise:

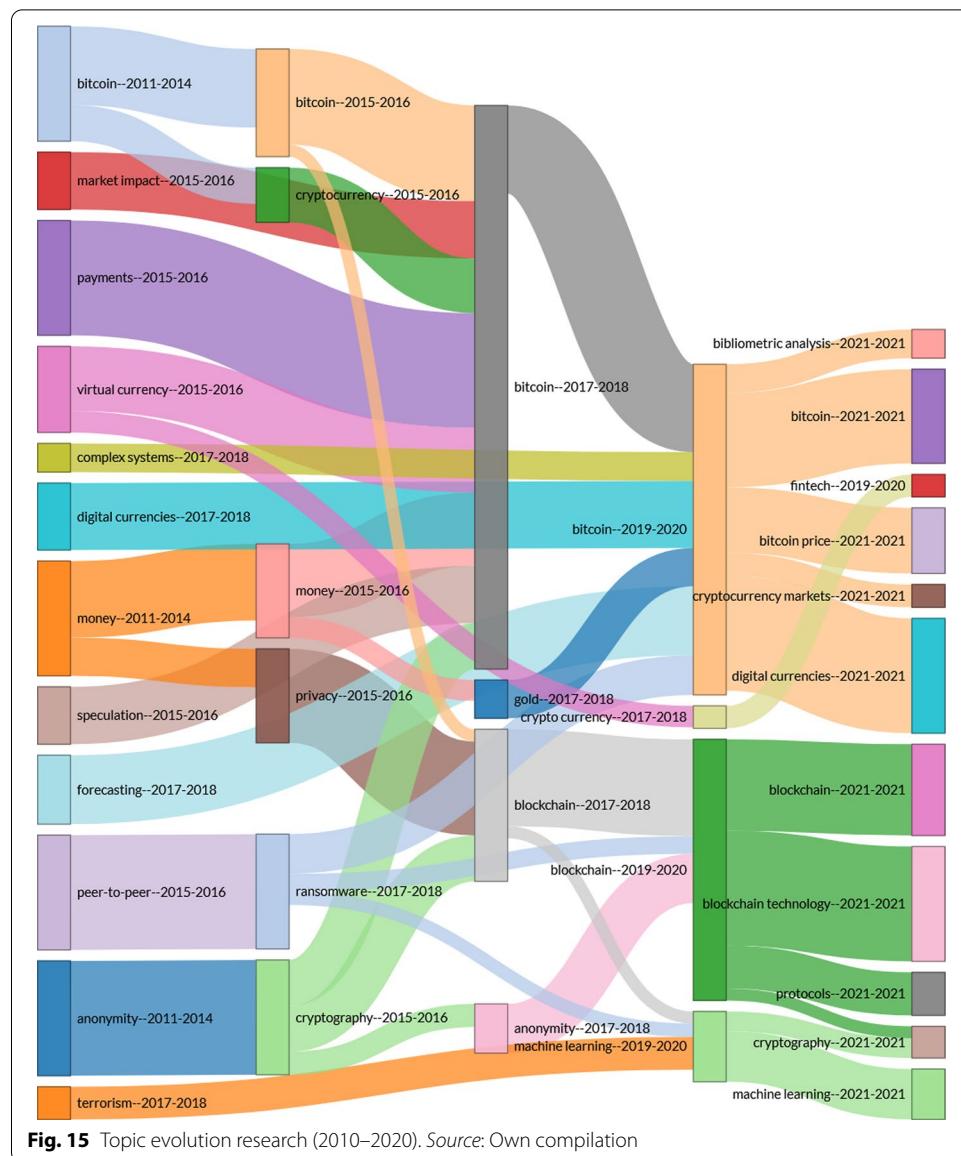
What should be the way forward for cryptocurrency research?

Cryptocurrencies will continue to be published, following the concepts of volatility, decentralization, and efficiency as characteristics, along with the smart contract as an application that initiated the 2.0 protocol. Especially in this context, the concept of efficiency or inefficiency should be emphasized in a broader sense, given that the cost of maintaining certain global networks based on peer-to-peer technology is starting to cause survival problems and requires optimizations that were already foreseen (Courtois et al. 2014). For example, Bitcoin power grid consumed approximately 2.55 GW of electricity in 2018, which is comparable to the consumption of countries, such as Ireland and its 3.1 GW (de Vries 2018). The hash rate, or the computing power



needed to keep the network stable and the technology moving forward, is its main strength and weakness. The network will be more secure the higher the ratio is held, but more complex to mine and more computational and energy intensive. For example, some markets are currently affected by the COVID-19 pandemic, among other reasons. Of these, and in direct relation to cryptocurrencies, we must highlight the lack of stock and increase in computer components (mostly graphic cards) used for mining algorithms (Allan 2021; Faulkner 2021). We have recently seen mining farms using laptops in parallel due to their lower power consumption or companies, such as Nvidia Corporation (2021), launching versions exclusively for these purposes. The use of these technologies is promising but uncertain based on their overall cost alone (Li et al. 2019).

Should these tools be separated generally from the technology created at the level of future research?



As mentioned before, a constant relationship has both a technological and an economic side. Undoubtedly, the impact of technology and its multiple applications will keep them together, so this separation will not materialize. Although cryptocurrencies have led the path, as shown in Fig. 15, blockchain technology is the main topic that will eventually leave Bitcoin and Ethereum as basic or niche topics, as Shen et al. (2020) concluded.

Can the technology created be applied to more business issues, and can they benefit from it?

Above all, the Blockchain network is the pioneering technology that has appeared in a number of publications on cryptocurrencies (Yli-Huumo et al. 2016). Since 2016, several authors, such as Yu Zhang, Young-Sik Jeong, K.K.R. Choo or J.H. Park have established this trend, with the highest number of mentions of blockchain appearing in late 2020.

Blockchain is a disruptive technology that can be used in all subject areas. This multiplicity of uses made necessary a systematic review, with special attention to business and economics (Xu et al. 2019). This suggests that we should take into account the application of the base technology and its potential applications at the business level (Zhao et al. 2016). Moreover, the cryptocurrency technology should be considered.

Based on the blockchain network analysis, this technology has great potential and offers many opportunities for the business area (Xu et al. 2019). The blockchain encryption system allows, for example, conducting secure and reliable financial transactions quickly, thanks to the distribution on independent nodes. The system also makes the data more difficult to falsify since it must be exchanged from multiple nodes simultaneously and allows the realization of smart contracts. Furthermore, it keeps the information more accessible because, as long as a node is still online, the information can be accessed; it does not have a single source server (Felin and Lakhani 2018; Gatteschi et al. 2018; Tönniseen et al. 2018; Chang et al. 2019).

## Conclusion

This study has reviewed an 8-year international search related to cryptocurrency due to bibliometric analysis of the WoS and Scopus databases.

The results show the positive evolution both in terms of the number of articles published and citations, with a growing number of publications and relevance in recent years. Comparing the evolution of both databases, we determine that WoS contains a greater number of citations received, whereas the Scopus database includes a greater number of articles. The main topics or research areas that contain the concepts related to cryptocurrencies are computer science and economics. If we delve further into the number of research areas in both databases, limiting the criteria to articles only, the enormous amount of categorical division seems to indicate that it is an interdisciplinary branch. However, on closer inspection, this perception changes because the majority of knowledge areas are related to the aforementioned sciences (i.e., computer science and economics). The subsequent thematic areas are legal sciences, criminology, philosophy, and physics.

The countries with the greatest number of publications are the USA, UK, and China, with the latter appearing alongside Canada in analyzing the most relevant keywords. The constant evolution of the regulatory framework regarding cryptocurrencies has generated various controversies at a global level. One notable case is in China, where after the general ban on Bitcoin trading in 2017, the Hangzhou Internet Court recently granted it a new status as a virtual asset. Hangzhou Internet Court was responsible for making cryptocurrencies public and reversing the ban without being considered fiat money. Meanwhile, the most used language for communications is English, coinciding with the native language of two of the countries with the highest rate of published articles. In contrast, although Chinese is not the language with the highest number of publications, China is one of the most often recurrent keywords in the last three years, making it a country showing the most interest in the subject. The authors' cluster analysis also demonstrates the high participation rate they acquire.

A more in-depth analysis confirms that the main journals and authors belonging to the ranking also belong to the countries with the highest number of publications, to clarify

any doubts that may arise from this new phenomenon. The number of outstanding journals and authors is increasing, but note that, especially when referring to authors, the wide participation of the Asian continent is prevalent if Scopus references are taken into account and even if the journals are English-speaking.

From the keywords obtained from the documents, the most frequent topics in the world of cryptocurrencies can be linked and recognized. Although WoS mainly contains words related to Bitcoin, Blockchain, and the volatility of these cryptocurrencies, Scopus publications focus on Bitcoin, Blockchain, and the technological aspects derived from them. Due to the importance of Blockchain technology, the publications on this topic have doubled in the last two years. A basic analysis of the theme shows a total of 550 articles in 2018, whereas the figure exceeds 1100 2019 in WoS. Scopus in turn shows results of approximately 650 and 1370. This is evidence of new lines of research among which stand out, blockchain appearing on both platforms as noteworthy, and Smart Contracts as an alternative to the conclusion of classic contracts that had been conducted.

At this point, and after starting to look at the reviews, especially of the most important keywords or the evolution in the discussion, we can see how the theory and background of cryptocurrencies has begun to conclude the publications on cryptocurrencies, leaving practical research as a new line of research. This opens the way to other interdisciplinary studies, especially after the controversy over the lack of regularization and harmonization in matters, such as legislative issues. Internally, these currencies are constantly revising and evolving to rectify the problems they previously had. Thus, the current information about them will be transformed by version periods, closing the chapter on version 1.0 and analyzing the modifications corresponding to version 2.0.

Finally, despite this study's contribution, it also has some limitations. First, the field of study is based solely on two of the most influential academic databases (WoS and Scopus). Second, the type of document included in the analysis has been limited to articles. Given the recent creation of the topic and trying to cover the largest possible field of study, expanding the results with Google Scholar as a third data source or using a wide range of publication types could yield a larger document count, which in turn could change the results, especially concerning the keywords used. If the subject were focused on documents from Google Scholar, but the type of publication was not delimited, some 7750 total documents would be obtained. The following will be included in the top 10 publications: "Blockchain technology: Beyond bitcoin," followed by "Zerocash: Decentralized anonymous payments from bitcoin," and "The inefficiency of Bitcoin." Although in different positions, all these articles are well placed in the two databases considered in this study. However, if the document type were to be extended, the existing procedural paper with the same time limitation as the articles in WoS amounts to 875, which, together with 684 articles, would add up to a total of 1559 of the 1678 results obtained. Scopus would yield a total of 1281 and 771, respectively, showing that 83.2% of the 2467 total results without applying filters are of both classes. In this way, an analysis of almost all the elements could be conducted.

#### Abbreviations

A: Articles; AC: Average citation; Au: Authors; BTC: Bitcoin; C: Country; ETH: Ether; FP: First publication; H: H-Index; J: Journals; JCR: Journal citation reports; LP: Last publication; R: Position in the ranking; RC: Research area scopus; RW: Research area WoS; Sco: SCOPUS; SJR: Scimago Journal Rank; TC: Total cites; WoS: Web of Science.

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**Authors' contributions**

FJGC contributed by retrieving literature, conducting data analysis and writing the paper. JdPV contributed by retrieving literature and participated in its design and coordination. JUT contributed conducting data analysis and revised the paper. JACG revised the paper and helped to write the manuscript. All authors read and approved the final manuscript.

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**Availability of data and materials**

The datasets analyzed during the current study are available on the following websites: Price: <https://coinmarketcap.com>, Web of Science: <http://wos.fecyt.es/>, Scopus: <https://www.scopus.com/>

**Declarations****Competing interests**

The authors declare that they have no competing interests.

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## CAPÍTULO 3. COMPENDIO DE RESÚMENES Y

### CONCLUSIONES INDIVIDUALES

#### 3.1. THE CIRCULAR ECONOMY AS AN AXIS OF AGRICULTURAL AND RURAL DEVELOPMENT: THE CASE OF THE MUNICIPALITY OF ALMÓCITA (ALMERÍA, SPAIN)

##### **Resumen**

El concepto de Economía Circular es algo que con el tiempo ha ido ganando importancia. Tanto es así, que esta política de desarrollo ha empezado a ser acuñada en nuestro territorio. Desde la Unión Europea se ha incentivado ampliamente que exista una política de desarrollo rural basada en la Economía Circular que incluya en las actividades productivas el fomento de las 3R (reducir, reutilizar y reciclar) aunque existe un campo ampliado que habla hasta de 9R.

Por tanto y viendo la especial importancia que está tomando en consideración este modelo, se plantea comprobar si el municipio de Almócita, eje del análisis, está realizando las actuaciones necesarias para encontrarse como un pionero dentro de la Economía Circular. El desarrollo sostenible es el santo grail que se busca, siendo necesario que se ponga de manifiesto. No es una selección arbitraria pues, a nivel provincial, se ha conseguido posicionar gracias a ganar premios como el “Premio Nacional Conama a la sostenibilidad de pequeños municipios”, a nivel andaluz ha sido galardonado con el “Primer Premio del VII Certamen de Buenas Prácticas de Educación Ambiental y Sostenibilidad Urbana en Andalucía”, y a nivel provincial consiguió el “Premio Hierba Buena” gracias al compromiso con las políticas de transición energética. También ha realizado tareas de divulgación y, a nivel innovador gracias a la Comunidad

Energética Fotovoltaica, se ha posicionado como el segundo municipio español en crearla, pero pionero en Europa gracias al sistema inteligente de implantación que utiliza la tecnología blockchain permitiendo el comercio de energía renovable entre pares (P2P).

Por ende y para mostrar si la orientación municipal está siendo lo más adecuada posible a nivel de eficiencia pues, se observa que la Economía Circular se pone de manifiesto en múltiples investigaciones pero únicamente desde una vertiente medioambiental sin incidir en los aspectos políticos, económicos, sociales que son de relevancia, se ha llevado a cabo un análisis PESTEL del territorio junto a una sistematización de experiencias con las actuaciones que se han o se llevarán a cabo en estos últimos y futuros años. Esto permite mostrar el modelo circular seguido. La sistematización de los proyectos va un paso más allá, vinculando los proyectos con distintos Objetivos de Desarrollo Sostenible y una justificación de lo realizado.

Como añadido, los proyectos realizados o planteados son: un banco de tierras, diversas charlas, talleres, eventos municipales y eco-mercados, un huerto, un horno y gallinero comunitarios en el área, proyecto de producción "setas ecológicas", banco de semillas y uso de semillas locales, un centro de compostaje, el desarrollo del área arbórea comestible, diversa participación en concursos, seminarios, ..., el desarrollo de un foro abierto mensual, la promoción de la bioconstrucción, una granja de huevos orgánicos, la puesta en marcha de la autosuficiencia energética, una comunidad pro-consumo y la eliminación del cableado en fachadas, un grupo de covivienda autogestionada, una puesta en marcha de eco-vivienda municipal en alquiler, la apertura o actualización de edificios multiservicios inteligentes ecológicos para el asentamiento de empresarios locales en zonas rurales, un nuevo plan de movilidad y turismo sostenible, el proyecto forestal ecológico y la puesta en marcha de diversos proyectos de cero residuos orgánicos.

## **Conclusiones**

Las conclusiones del texto son diversas que pasan desde una vertiente más teórica debido a la extensión del estudio del arte, hasta algo más práctico por el análisis municipal.

Por tanto y como se reseña, ya a un nivel más teórico, se puede confirmar que la Economía Circular como un modelo de desarrollo local es totalmente válida permitiendo aportar una estrategia de desarrollo sostenible a todos los niveles. Se produce una ruptura de la producción anterior lineal hacia una nueva circular que planifica más desde la extracción hasta la comercialización. No se observa como un impedimento para el desarrollo enfocada únicamente en ideas de orientación medioambiental, sino que se tiene que ver como una propuesta que integra totalmente de lo que se dispone. Es decir, los recursos endógenos propios.

Pero para su correcta puesta en marcha, es necesario que se efectúen todas las políticas posibles, actuando de manera horizontal y transversal, porque es ese dinamismo que surge el que va a abrir las puertas a la sostenibilidad en todas sus vertientes.

Ahora y ahondando en el nivel más práctico, el municipio de Almócita ha realizado diversas labores de adopción dentro de la Economía Circular. En la lista de proyectos se puede observar que se han realizado tanto de índole privada como de índole pública vinculándose con los ODS y realizando una labor muy importante, como es la difusión del conocimiento. No solamente se están centrando en elaborarlos, sino que con campañas informan de lo realizado.

Aun así, varias de sus actuaciones podrían verse mejoradas o supervisadas de una manera más eficiente, puesto que el monitoreo de algunas de esas se deja de lado en virtud de algo simple pero práctico, como es el centro de compostaje. De cualquier forma, también consiguen despuntar en otras que llegan a ser pioneras gracias a la implementación de tecnología secundaria como es el blockchain. Esto realmente demuestra que los proyectos realizados y los planificados se encuentran dentro del modelo circular de desarrollo que puede ayudar al municipio a subsistir en una zona de despoblación.

Es por tanto posible ver como el municipio consigue aumentar la calidad de vida y el bienestar de los almociteños mediante el nuevo sistema económico.

## 3.2. COMPLEMENTARY CURRENCIES: AN ANALYSIS OF THE CREATION PROCESS BASED ON SUSTAINABLE LOCAL DEVELOPMENT PRINCIPLES

### Resumen

Actualmente existen diversas herramientas como son las monedas complementarias que se usan como mecanismo para estimular el mercado tanto a nivel local como de manera global. Estos medios de pago alternativo creados desde un enfoque ascendente por los habitantes son usados con múltiples fines intentando frenar todas las desigualdades que les rodean. Por tanto, son mecanismos de apoyo a la sociedad, al medioambiente y a la economía, permitiendo agilizar y mantener el capital más focalizado a su alrededor.

Esto las convierte en un movimiento social de cambio del sistema hacia un método más sostenible, equitativo y centrado en el ser humano. Son y han sido entonces unos estimuladores del desarrollo local que deben tenerse en cuenta, aunque como todas las alternativas, poseen una serie de problemáticas.

Siendo conscientes de todo ello y conociendo que dentro de la Economía Circular está ese factor solidario, se pretende comprobar si estas iniciativas tienen cabida en el municipio almociteño. Para ello, se parte un análisis múltiple basado en las metodologías Positivo-Interesante-Negativo (PIN) sobre esas herramientas, un “Globo volador” y un análisis DAFO en el que se muestra tanto el pensamiento vecinal como información externa, junto a un Ranking de Factores de Éxito y una lluvia de ideas, que dará una idea sobre la posibilidad de aplicabilidad o no.

El muestreo realizado a una tercera parte de los habitantes del municipio (tanto residentes habituales con y sin vinculación laboral allí, como a unos residentes temporales en época estival), junto a los empresarios del lugar, se resume en la matriz del Globo Volador, y en información complementaria sacada de las entrevistas en parte de la matriz DAFO. Así pues, esa indagación se completó con información municipal extraída de diversas fuentes como es la base de datos del Sistema Multiterritorial de Andalucía (SIMA) y la web oficial y complementarias del Ayuntamiento de Almócita. Con todo ello, se realizó un Ranking de los Factores de Éxito y una lluvia de ideas que incluyen varios proyectos que pueden

o podrían realizarse, en el que se encuentran labores de difusión municipal o la elaboración de una moneda propia.

La población local comentó o mostró especial atención en la escasez de población joven junto a la falta de trabajo diversificado, por lo que, más allá de lo visto en los análisis anteriores y bases de datos, el tema de la falta de relevo generacional lo tienen presente constantemente. Esta situación ha generado una sensación vecinal de unión y los habitantes se mostraron receptivos ante los proyectos propuestos especialmente si estaban liderados por el Ayuntamiento o esa entidad se encontraba involucrada como otro actor más en su desarrollo propio. Especialmente se debe remarcar que los foros de debate que tienen a nivel vecinal son un gran aliciente que les hace ser partícipes en todo momento y de donde se sacan bastantes ideas.

### **Conclusiones**

De manera extendida, el uso de monedas complementarias ha sido positivo para el entorno siempre y cuando se plantee de una manera correcta. Al empezar a observar el pensamiento vecinal sobre estas herramientas se denota una positividad y aceptación bastante alta aunque especialmente por parte de los nuevos pobladores o los pobladores más jóvenes. De hecho, durante la realización de las visitas y las entrevistas se dejó constancia de que algunos habitantes ya habían tenido manejo de estas alternativas de una manera muy clásica con monedas locales. Esto hace más fácil la nueva adaptación de una moneda actualizada en el entorno intentando reavivar el sector económico.

Pero no todo resulta positivo pues, aunque se parte de una idea y aceptación muy amplia, el sector económico reconocía la idea de formar parte de la moneda pero necesitaba de un mayor proceso de explicación y aprendizaje sobre el funcionamiento que se les puede dar. Únicamente una integrante del colectivo de empresarios había tenido manejo con anterioridad de estos mecanismos de pago.

Ahora y de modo más general, todos los habitantes almociteños poseen una amplia sensación de pertenencia a la zona dando consistencia y esencia a los proyectos que se efectuaban, pero seguían teniendo otras carencias frente a las que preocuparse antes de empezar a participar en la vida de un método de pago alternativo. A nivel local se deja ver que es una zona con una alta tasa de paro y esta

herramienta podría ayudar a estimular la economía local, pero no llegaban a entender la idea, teniendo división municipal en su uso inmediato.

Esto quiere decir que, de una manera más hipotética, el análisis mostrado sobre las monedas complementarias deja ver que se pueden acuñar diversos tipos. Conocer que los nuevos habitantes y parte de la población especialmente más joven son conscientes de la existencia de estas herramientas permite con mayor facilidad la identificación de una nueva propuesta de esta índole, aunque en el momento de la investigación, están demasiado centrados en el desarrollo local normal sin entrar a prestar atención a como iría si se implanta. Se ve la posibilidad de establecerla y el sector económico se ha mostrado de acuerdo en que se puede hacer algo, simplemente falta equilibrar más el porcentaje de habitantes que puedan darle apoyo y mejorar los conocimientos sobre ellas. Con una serie de reuniones municipales se puede cambiar el punto de vista y dar el cambio de parecer de los habitantes restantes para que se implante.

### 3.3. A BIBLIOMETRIC REVIEW OF CRYPTOCURRENCIES: HOW HAVE THEY GROWN?

#### Resumen

Las monedas complementarias o los métodos alternativos de pago han estado siempre en el mundo económico. En el momento del desarrollo ya se contabilizaban más de 6.000 tipos de métodos aunque no existe una base de datos que las recoja todas con total exactitud. Si bien es cierto que las criptomonedas son una nueva categoría que debido a la repercusión tomada pueden crear su propia especie, la base puede incluirlas dentro de estos métodos de pago alternativos por contar con las características típicas de estas.

El origen de estas monedas fue anterior al S XXI, estando planteadas monedas virtuales como el e-gold en el año 96, pero fue con la llegada del Bitcoin en el 2008 por Satoshi Nakamoto cuando se las empezó a ver en la esfera socioeconómica a un nivel global.

Durante su existencia, han sido tratadas multidisciplinariamente puesto que no solamente es un método de pago, sino que han añadido una serie de tecnologías disruptivas que hacen que, en mayor o menor medida, su planteamiento sea mucho más estable de lo que se venía planeando, viendo que entran a nivel global. Pero es justamente ese planteamiento global y la tecnología creada los que están llevando a distintos problemas propios pues parten de la base de ser algo único de creación, no parecido a nada anterior, por lo que su regulación está abierta.

Esto deja ver que antes de empezar a plantear la creación de una moneda o no de estas características, sea necesario conocer que hay a todos los niveles. Por ello y gracias a un análisis bibliométrico sobre criptomonedas (concepto general), y Bitcoin y Ethereum (2 de las más conocidas), se pretende empezar la indagación de un tipo de herramienta que ataña a múltiples áreas de conocimiento.

En el artículo se hace una distinción temporal de los 10 primeros años de vida de estas monedas como análisis bibliométrico para ver qué, quiénes, dónde y cómo se están enfocando esas monedas. A continuación de la bibliometría, se actualizan los datos y se parte de hasta el año 2020 para examinar en más profundidad las tendencias, fomentando así un debate más actual.

Respecto a la información más crucial vista en las tendencias, se ve como el Bitcoin sigue siendo el eje central de las investigaciones, así como los conceptos de blockchain, dinero y seguridad. Complementado a ello, se especifica la falta de regulación legal y la complejidad de elaboración de una normativa, puesto que no existe una unanimidad a nivel global de su trato. Ello sí, ha empezado a aparecer el concepto de seguridad como algo recurrente.

Esto deja que las criptodivisas son, aun desde su vertiente negativa, una herramienta que ha venido para quedarse no solamente por su posible uso o no, sino porque son las pioneras en determinadas tecnologías cuya aplicabilidad es multifacética. Sobre la eficiencia o ineficiencia que se muestra en las investigaciones parece estar íntimamente relacionada con los distintos protocolos de funcionamiento, necesitando de mayor profundización según evolucionen.

Es decir, su uso no desprende investigaciones únicamente económicas, sino que tiene un lado tecnológico. Es esa marca tecnológica la que, aunque haga por ahora que las criptomonedas lideren las investigaciones, se nos muestre que se ha abierto el camino a algo no esperado que va a aumentar su perduración. Como ejemplos, está el sistema de encriptación que permite entre otras muchas cosas, realizar transacciones financieras ágiles y seguras de una forma mucho más repartida, a la vez que dificulta la labor de falsificación, o el sistema de descentralización que mantiene la información más fácilmente accesible al haberse diseminado todo entre nodos que no saturan un único servidor.

## **Conclusiones**

Mediante el análisis bibliométrico de los primeros años en la vida de las criptomonedas junto a la revisión de las tendencias en detalle, partiendo de las bases de datos WoS y Scopus, se detraen diversos apartados de bastante relevancia.

Primeramente, se puede observar como el número de artículos y citaciones va creciendo paulatinamente, haciendo ver como se está ganando importancia en el tema. Así pues, las áreas de la informática y la economía son las encargadas de sus mayores publicaciones, aunque existen diversas áreas temáticas que parecen ir tomando también jerarquía como son las jurídicas y la física. Estas publicaciones priorizan en EEUU, Reino Unido y China, aunque es en este último en el que se abordan más recientemente las

investigaciones debido en parte a los vaivenes de permisividad. Aclarado ello, de esos países son, además, los autores tanto a nivel editorial como a nivel personal con un mayor número de incidencia de publicaciones.

Pero lo realmente importante empieza con el análisis de las palabras clave y tendencias puesto que se ve como no solo está el Bitcoin, sino que la red blockchain, la volatilidad y las características de estas monedas son de constante discusión. Las tecnologías acuñadas por este tipo de divisas están incluso tomando más fuerza y llegando a ser un campo de investigación propio. Por el contrario, las propias monedas necesitan ser vistas con una serie de características unánimes que les permita alcanzar una regulación puesto que ha sido desde el momento en el que se han empezado a regular, en el que su auge ha ido en aumento al haberlas indirecta o directamente colocado en el foco de todos.

Esto les abre las puertas a su existencia e importancia, tomando un papel fundamental en el mundo económico-informático que, aunque con sus problemáticas, van a hacer que su irrupción sea frutífera e indeterminada en el mundo.



## CAPÍTULO 4. CONCLUSIONES GENERALES Y

### NUEVAS LÍNEAS DE INVESTIGACIÓN

#### 4.1. CONCLUSIONES

Tal y como se ha podido comprobar a lo largo de la lectura del presente compendio, la Economía Circular no es únicamente un modelo económico aplicable, sino que abre las puertas a múltiples campos de estudio tales como la agricultura, el turismo, el desarrollo local, o la teoría-práctica jurídica, pero incluye también a otras ramas tal vez menos planteadas como es la ingeniería informática. Es decir, en el contexto municipal de desarrollo que hoy día hay que seguir, la innovación va a ser un baluarte más y principal de todas y cada una de las actuaciones que se realicen.

Partiendo de la base de que la provincia de Almería se observa como una de las mejores pujantes demográficamente hablando, pero que ese crecimiento se encuentra orientado en su vertiente costera (INE, 2022), hay que prestar atención a sus municipios de interior que también se encuentran compitiendo en el mismo mercado. Bajo esta tesis, la despoblación es un problema que hay que observar y combatir si se pretende que ese desarrollo sea sostenible.

De los distintos análisis municipales que se han llevado a cabo al municipio almeriense de Almócita, encontrado únicamente a 55 km de la capital provincial, se observa como aunque se realizan arduas labores de desarrollo local, la despoblación está haciendo mella. La edad media de casi 50 años lo deja en una situación de búsqueda de soluciones de subsistencia no barajadas con anterioridad.

Debido a ello, la perspectiva sostenible está siendo el eje central de sus actuaciones pasadas más recientes, así como el hilo conductor de sus actuaciones presentes y futuras planteadas. Ese eje circular de desarrollo está colocando al municipio en un sector primeramente de visibilidad, atractivo tanto a nivel

de establecimiento temporal mediante un turismo sostenible, como de establecimiento fijo de nuevos habitantes que compartan su punto de vista, para de manera secundaria, dotarlo de unas posibilidades de desarrollo únicas enfocadas en las personas y su entorno.

Así pues, la estrategia basada en la sostenibilidad ha dado pie a proyectos sociales como las comunidades de pro-consumo, huerto, gallinero y horno comunitario, junto a otros de índole más económica como la producción de verduras ecológicas con un distintivo propio o planes de turismo sostenible en el entorno. En todos se ha pensado de manera medioambiental, aunque de un modo transversal, viendo como hay acogida a proyectos más simples como la recogida y reutilización de semillas propias locales y el banco de semillas, o el proyecto de repoblación forestal, así como otros más complejos como las ecoviviendas o el proyecto de cero residuos orgánicos y la zona de compostaje.

Son todas esas iniciativas bajo un mismo principio las que están dotando de una identidad única y fuerte al municipio para su desarrollo sin comprometer la degradación del medio natural a las generaciones venideras. La sostenibilidad del municipio es más que su forma de progreso, es un pensamiento de vida, en la que todas las medidas son tomadas de la manera más eficiente para beneficiar tanto a la comunidad local, como a su entorno, estableciendo un conjunto de buenas prácticas. Esas prácticas a su vez son de divulgación, permitiendo conocer las actuaciones a un nivel estatal e incluso europeo (Europapress, 2021).

Aclarado ello, la viabilidad de una moneda complementaria en el municipio para fomentar su desarrollo esta más que contrastada. A la fecha de la realización de las investigaciones sobre su puesta en marcha o no, la idea ya empezó a calar en el municipio y era fuerte. Faltaba especialmente la adecuación a un público objetivo mayor ya sea de manera interna con charlas para los vecinos que no querían participar en la vida de la moneda, como de manera externa a municipios limítrofes que quisieran incluirse en el ámbito de una moneda que permita el desarrollo esta vez extendido pero desde una vertiente sostenible. Así pues, y aunque no es una consecuencia que quede reflejada en las publicaciones, a posteriori se ha puesto en marcha una moneda complementaria en la zona de índole virtual (sin mediar medio físico) gracias al software Cyclos durante el año 2022 con iniciativa vecinal (La Voz de Almería, 2022).

Es por tanto doblemente redundante pero necesario mencionar la viabilidad de esta investigación que, ya como se pudo ver en las conclusiones de los artículos, era factible su existencia con algunas connotaciones que han variado desde su análisis y publicación hasta la actualidad, dando como fruto el resultado esperado. Pero eso no hace más que abrir nuevos retos especialmente a nivel económico, social y jurídico para garantizar la sostenibilidad local. Es donde entra el papel de la eficiencia y su regulación, especialmente a expensas de las actuaciones correspondientes por los órganos reguladores.

Como conclusiones del artículo sobre criptomonedas, se puede ver como existe un auge imperioso en estos sistemas no regulados de alcance global. Resulta entonces imprescindible que una vez que se ha empezado la aventura de supervisarlas, se realicen las labores correspondientes de adecuación de forma, para que aunque sea a nivel europeo, sea tratado de una manera unánime y poder empezar a dirigir un rumbo fijo. Esta definición o conceptualización segura es la que va a hacer que la digitalización de la herramienta permita una estandarización de su consumo.

En el ámbito de las criptomonedas es frecuente ver hablar de la capacidad de coste generado por tenerlas entrando en detalles sobre su consumo energético, dificultad de cálculo y materiales necesarios, etc., pero no se entra a observar que se trata de un mecanismo utilizado a nivel mundial que conforme avanza el protocolo y su tecnología paralela, son carencias que se van paliando. La diferencia de una criptomoneda de protocolo 1.0 a una de 2.0 es impensable, sin haber entrado en detalle con el tercer nivel. Desde un “rudimentario” trueque monetario (realizado en protocolo 1.0), se ha llegado a pasar a elaboración de contratos inteligentes (protocolo 2.0). La evolución que se ha sufrido debido a estas herramientas y su tecnología ha sido tal que se ha estado vinculando con una de las ideas fundamentales de la “Web 3.0”, u originalmente la evolución de la red de Internet tal como se conoce, centrándose especialmente en la descentralización (Ragnedda y Destefanis, 2019).

Por ello se requiere de una labor de reorientación de las distintas políticas regulatorias para permitir el desarrollo de estas tecnologías, se quiera o no generar un uso posterior, porque han sido creadoras de procedimientos que se están haciendo patentes en todas las áreas. En caso de ignorarlo, va a encontrarse con que las criptomonedas son diferentes según la parte del mundo en la que se usen, pero con la misma incidencia, y estando cada vez más presentes de una manera directa o indirecta.

## 4.2. FUTURAS LÍNEAS DE INVESTIGACIÓN

El análisis de las futuras líneas de investigación es múltiple, dependiendo del conjunto teórico visto que se quiera seguir. Primeramente, está la posibilidad de seguir la orientación sobre el desarrollo local sostenible, enfocado especialmente en un modelo económico circular. Esto abre la posibilidad a:

- Investigaciones internas municipales que reflejen la aplicación de este modelo económico y su repercusión, así como los factores unánimes de éxito en todos estos proyectos.
- A nivel social, llevar más en profundidad una investigación específica en la población de la zona para comprobar cuales han sido los motivos exactos por los que han venido a residir y contrastarlo con los nuevos habitantes de las zonas limítrofes.
- A un nivel económico, comprobar la evolución de los sectores productivos y contrastarlo con las ideas anteriores realizadas.
- Crear planes estratégicos municipales individuales, así como comarciales, partiendo de la sostenibilidad.
- Partiendo de una idea más reciente, contrastar las repercusiones que ha tenido la pandemia del COVID-19 a nivel económico, social y medioambiental en el área de actuación, y observar si ha incidido en la actualización del modelo económico.

En segundo lugar, estaría la línea enfocada en las monedas complementarias:

- En la escala municipal, comprobar el grado de implicación de la gente tras su puesta en marcha, así como una actualización a futuras que incluya dotarla de un mayor peso.
- A un nivel económico, revisar la repercusión de las monedas sociales en el sector y ver si ha conseguido los objetivos con los que se propuso.
- De manera más general, y compartida con el siguiente punto, realizar una investigación en profundidad sobre los tipos, los conceptos y seguir creando un listado dividido por características para poder profundizar más en su nivel teórico.

De la tercera investigación, especializada esta vez en las criptomonedas, se abren todos los caminos anteriormente dichos más los sucesivos relativos a la tecnología que han generado y especialmente vinculado al uso de las tendencias y palabras clave:

- Realizar un análisis sobre la eficiencia de las monedas criptográficas y especialmente diferenciado en protocolos.
- Realizar análisis históricos sobre los precios acuñados a estas monedas y vincularlos a su conceptualización, para comprobar y crear modelos de predicción sobre su volatilidad.
- Crear una base de datos sobre la distinta tipología de estos métodos de pago.
- Informes sobre la red blockchain y la descentralización, así como de la seguridad que aportan y su desarrollo, tanto teórico como práctico, para la actualización del internet que se conoce hoy día.



## CAPÍTULO 5. ADELANTO DE LA PRESENTE Y

### FUTURA INVESTIGACIÓN

Cerrado el cuerpo objetivo de la tesis y remarcadas las posibles futuras líneas de investigación, no puedo dejar el presente documento sin mencionar la evolución de las aportaciones que no están incluidas dentro pero que comenzaron durante el transcurso de esta y tienen aspiración a continuar. Ello es debido a que el auge de las monedas complementarias vinculado a la existencia de las criptomonedas hace que deban seguir en constante investigación.

Ha sido la problemática con la falta de regulación y verlas sin un marco jurídico, junto que han existido controversias ya a nivel práctico por no declarar los métodos alternativos de pago, lo que ha motivado inicialmente parte del contenido siguiente. Pero, cabe aclarar que esto no ha surgido con las criptomonedas únicamente, sino que también ha sucedido con las monedas locales “tradicionales”.

Por ejemplo, mediante “las panchas”, la no inclusión en la declaración de la renta de las aportaciones que hizo el concejo ha creado complicaciones en el pueblo puesto que debía declararse y cotizarse como ingreso. Eso es debido a que la entidad municipal realizó un aporte que debe reflejarse en el apartado de subvenciones y otras ayudas satisfechas por las administraciones. Al cotizarse por ese ingreso, era posible que se diera el caso de que algunas personas suban de tramo, y eso ha pasado (La Voz de Galicia, 2022).

Es esa sensibilidad a la carencia vista como un tipo de curiosidad cuyo estímulo emocional es de tipo negativo, como el que se siente al querer saber la manera de resolver un problema por el que van a evaluarnos o simplemente querer conocer que pasará a continuación tras algo que intriga, la que hizo que la investigación actual se encuentre centrada especialmente en la regulación de las criptomonedas a nivel estatal y una comparativa a nivel europeo sobre lo que hay individualizado. Hasta que el

Reglamento de Mercados de Criptoactivos conocido como MiCA entre en contexto, no se podrá comprobar si con la armonización de la normativa se empiezan a despejar los escollos producidos. Habrá que estar atentos puesto que está previsto que el Parlamento Europeo lo apruebe para finales del 2022 y que entre en vigor a lo largo del 2024.

Pero, ¿qué se entiende por MiCA? El Consejo Europeo aprobó MiCA el pasado octubre de 2022 como uno de los primeros intentos a nivel mundial. La regulación afecta especialmente a los temas más problemáticos como son el lavado de dinero, la protección de los usuarios, la responsabilidad de las empresas que operan con estas herramientas de manera directa, así como una regulación del impacto que tienen medioambientalmente (Akim Gump, 2022).

MiCA será un instrumento legislativo de amplio alcance diseñado para las actividades que se lleven a cabo dentro de la Unión Europea. Se vincula a las palabras clave que se han podido ver en el artículo publicado en Financial Innovation, especialmente con transparencia, divulgación y supervisión/regulación. Será un reglamento de aplicación universal a personas tanto físicas como jurídicas, prestando atención a las que se dediquen a la emisión o transmisión de estos activos, o que realicen cualquier prestación de servicios con ellos. Se busca con la regulación aumentar la confianza que tienen los consumidores depositada en los criptoactivos para poder reforzar posteriormente el desarrollo de servicios digitales innovadores que tengan estas herramientas u otra tecnología paralela similar en su funcionamiento (Consejo Europeo, 2022).

Así pues, parte de una base sólida al crear su propia concepción de criptoactivo y una subdivisión en tres subcategorías: tokens (dinero electrónico), tokens (activos) y los restantes (tokens de uso o utilidad). Los criptoactivos que ya se encuentran regulados no van a formar parte de los regulados por MiCA principalmente, sino que se basa en los últimos o los que no tienen ninguna regulación (EU, 2022). Respecto a los futuros y también a otros conceptos, se visualizará la ampliación y es posible que algunos más recientes como los NFT por ejemplo no aparezcan inmediatamente regulados, por lo que habrá que comprobar a posteriori si entran en alguna categoría.

El Reglamento permitirá la administración por las autoridades competentes que cada Estado designe. También expone uno de los conceptos más importantes, los llamados “Whitepaper”, en los que cualquier entidad que desea ofrecer estos activos, deberá redactar un libro blanco de divulgaciones obligatorias y otra serie de información importante dependiendo del activo a tratar (EU, 2022).

Pero a expensas de su publicación y actualmente a nivel particular, me encuentro realizando una labor comparativa de regulación a nivel europeo que sintetizaré en la Tabla 1:

**Tabla 1: Tabla resumen regulación en la Unión Europea**

PAÍS	APROXIMACIÓN A LA CRIPTOMONEDA Y/O NIVEL IMPOSITIVO
Alemania	<p>En Alemania, las transacciones realizadas con monedas criptográficas están sujetas a diversos impuestos como el Impuesto sobre la Renta. La Bundeszentralamt für Steuern (BZSt) se ha encargado de establecer una serie estricta de directrices sobre el gravado por compra, comercio y minería, especialmente las ganancias de capital a corto plazo. Resumidamente, en el caso alemán de renta, el tipo iría hasta el 45% más el 5,5% del Impuesto de Solidaridad.</p> <p>Las criptomonedas se consideran activos privados con las particularidades fiscales que de ello derivan. Además, hay transacciones de criptomonedas que se consideran ingresos (minería o recompensa de apuestas).</p>
Austria	<p>El Bundesministerium für Finanzen austriaco publicó durante el comienzo del año 2022 una guía sobre las criptomonedas y su regulación, y es uno de los lugares con mayor movimiento de impuestos a estos métodos de pago.</p> <p>El Ministerio Federal de Finanzas ha considerado que son un activo intangible pero las grava como un ingreso para el Impuesto sobre la Renta. Con la última actualización, se grava como las acciones.</p> <p>Además, se ha manifestado diciendo que quiere saber las transacciones que se realicen con estos mecanismos y que trabajará con otros organismos para regularizar las actuaciones.</p> <p>El funcionamiento es especial porque dependerá de la ganancia y del tipo de transacción realizada, aunque no aparece en su Impuesto sobre Ganancias de Capital, sí que aparece vinculada al Impuesto sobre la Renta.</p>

	<p>Por ejemplo, sobre las ganancias netas de capital resultantes de las ventas de criptoactivos se pagará un tipo fijo del 27,5%, aunque dependiendo de si la cantidad total no supera un umbral de 440€ al año natural, estaría libre.</p>
<b>Bélgica</b>	<p>Desde febrero de 2022 en Bélgica se cuenta con una normativa que se encarga de la supervisión de los proveedores de servicios de cambio de monedas virtuales. A su vez, se puede considerar como uno de los países con mayor tributación. Tiene una política de impuestos del 33% sobre las ganancias de capital y un esquema de impuestos del 50% para los ingresos en profesionales de operaciones de estos activos.</p>
<b>Bulgaria</b>	<p>En Bulgaria no existe una ley específica que regule las monedas virtuales. En el país, el Banco Nacional se ha pronunciado sobre los riesgos de estas monedas por la alta volatilidad. También consideran que los ingresos generados por las transacciones con criptodivisas deben considerarse ingresos procedentes de la venta de un activo financiero.</p> <p>Por ejemplo, de la venta de un activo, se gravaría un 10% de los beneficios que se obtuvieron durante el año natural.</p>
<b>Chipre</b>	<p>La Cyprus Securities and Exchange Commission (CySEC) aprobó en 2018 la C268 y en 2020 la Circular C417. A partir de entonces se mostró que los derivados de las criptodivisas son instrumentos financieros.</p> <p>Para determinar el tipo de impuesto, se parte de si se realiza o no actividad comercial y si existe un beneficio. Evalúa principalmente las ganancias de las actividades comerciales o transacciones aisladas.</p>
<b>Croacia</b>	<p>Siguiendo las directrices propuestas por la UE, para Croacia, las criptomonedas son “<i>aquella representación digital de valor no emitida ni garantizada por un banco central o autoridad pública, no necesariamente asociada a una moneda legalmente establecida y que no posee estatuto jurídico de moneda o dinero, pero que es aceptada como medio de cambio y puede ser transferida, almacenada o negociada electrónicamente</i>”.</p> <p>El comercio de estos activos lo consideran como una transacción financiera. Los beneficios están sujetos al Impuesto sobre la Renta de las Personas Físicas (alrededor del 12% aproximadamente).</p>
<b>Dinamarca</b>	<p>La Skattestyrelsen ha dado una orientación sobre los tributos a estas monedas que van a variar dependiendo de las inversiones, del beneficio y del municipio de residencia. No se considera</p>

	<p>moneda fiduciaria, por lo que hay impuestos que no se le aplican. Por el contrario, es un activo personal que se grava si se usa como forma de negocio o con fines especulativos.</p> <p>En este sentido, se gravan las pérdidas y ganancias en impuestos como el Impuesto sobre la Renta.</p> <p>Para calcular estos beneficios-pérdidas, hay que restar la base de coste del precio de venta en el momento de su enajenación. A posteriori, deberá aplicarse los tramos en función del: Impuesto sobre la base imponible (estatal), Impuesto de tramo superior (estatal), el Impuesto sobre el mercado de trabajo (estatal) y el Impuesto municipal (local). Todos pagan el puesto sobre el trabajo y el municipal, estando los otros sujetos a unos requisitos.</p>
<b>Eslovaquia</b>	<p>En el país no se ha establecido un marco regulador aún. El Národná banka Slovenska (NBS) es el responsable de la política monetaria y de supervisar al mercado financiero dando una identificación a los activos digitales creados mediante la minería. Diferencia entre los activos virtuales, los tokens de utilidad y los de inversión. También ha introducido un sistema regulador para promover la innovación en el país gracias a nuevas herramientas y, en su mayoría, espera el desarrollo del marco regulador de la UE puesto que atendiendo a la antigua legislación eslovaca, los activos criptográficos no son instrumentos financieros.</p>
<b>Eslovenia</b>	<p>La Finančna uprava Republike Slovenije (FURS) ha querido aumentar la regulación sobre las monedas electrónicas y ha propuesto una tasa impositiva del 10% al gastarse o intercambiarse por dinero efectivo. En el país se lleva activamente un seguimiento de las actividades individuales realizadas por los eslovenos y tienen que pagar impuestos sobre el beneficio de adquisición de las criptomonedas.</p>
<b>España*</b>	<p>De manera breve, se tienen que pagar impuestos estando sujetas por ejemplo al Impuesto sobre la Renta, Sucesiones y Donaciones y el Impuesto sobre el Patrimonio, según el acto jurídico realizado.</p> <p>La Agencia Estatal de Administración Tributaria (AEAT) no tiene aún unas directrices únicas, habiéndose hecho nada más que unas orientaciones.</p>
<b>Estonia</b>	<p>Según Maksu- ja Tolliamet (MTA) o Estonian Tax and Customs Board, las personas físicas están obligadas a la declaración de los ingresos procedentes del comercio, conversión, intercambio o el pago de bienes o servicios. Además, los ingresos procedentes de la minería se consideran ingresos empresariales. Todos los ingresos restantes recibidos en criptomoneda (alquiler, por</p>

	<p>ejemplo), también están sujetos al Impuesto sobre la Renta, y la prestación de servicios, así como el intercambio o la minería, podrían llegar hasta estar sujetos a IVA.</p>
<b>Finlandia</b>	<p>En Finlandia, Vero Skatt, o la Administración Tributaria finlandesa, no considera a estas monedas como moneda de curso legal, sino que es un activo personal negociable. En ella están sujetos los beneficios del intercambio o venta como ingresos de capital al impuesto sobre las plusvalías, cuyo tipo es del 30% (rentas de capital que no superen los 30.000 €) y del 34% (exceso de este límite). Otros ingresos como son los de la minería se consideran rendimientos del trabajo a efectos fiscales sujetos al Impuesto sobre la Renta.</p>
<b>Francia</b>	<p>En el país francés, las monedas virtuales criptográficas están sujetas al Impuesto sobre la Renta. La Direction générale des Finances publiques (DGFiP) ha establecido una serie de directrices sobre cómo se grava la compra, el comercio y la minería. Las criptomonedas son consideradas como un bien mueble gravado al enajenarse. No se pagan impuestos con la compra, cambio de las criptomonedas sobre otras criptomonedas, o en el mantenimiento de estas. Por tanto, se debe estar atento a la conversión en moneda de curso legal, las ganancias de esas enajenaciones o si se ha adquirido mediante minería u otro rendimiento del trabajo. Respecto a esas plusvalías de los activos digitales, el gravado va a estar condicionado a la asiduidad, diferenciando entre operadores ocasionales y profesionales, así como los mineros con un impuesto propio. Aún así, existen diversas puntualizaciones como una tasa fija independientemente de los ingresos de referencia.</p>
<b>Grecia</b>	<p>Grecia no ha adoptado un régimen normativo específico todavía para estas monedas, no considerándolas como un instrumento financiero. Ha sido la Independent Authority for Public Revenue (IPRA) la que ha declarado su intención de que tributen las transacciones que se marquen como ingresos, aunque no hay nada regulado a 2021. A principios del año 2022, seguían los ingresos vinculándose al Impuesto sobre la Renta con un gravado del 15%.</p>
<b>Hungría</b>	<p>A comienzos del año 2022 se modificó la Ley del Impuesto sobre la Renta de las Personas Físicas y se introdujo un nuevo apartado. La disposición legal introduce el concepto de renta por criptoinstrumentos y define ganancias de transacción y pérdidas de negocio. Las rentas de los criptoactivos están sujetas al IRPF del 15 %. Los intercambios de un activo criptográfico por otro no son aún hechos imponibles. Eso sí, hay que estar atentos a la fecha de realización de los</p>

	<p>ejercicios. Anteriormente estaba sometida a un impuesto de contribución del 15,5% más el IRPF del 15%.</p>
Irlanda	<p>El país irlandés posee también impuestos sobre las criptomonedas que las considera como una propiedad, activo o acciones. Na Coimisinéirí loncaim o el Revenue Commissioners irlandés ha mostrado que están sujetas al Impuesto sobre la Renta y al Impuesto sobre las Plusvalías. Además, está el Impuesto de Sociedades para empresas que realizan transacciones con criptodivisas y, en algunas circunstancias específicas, el Impuesto sobre Adquisiciones de Capital.</p> <p>La cantidad de impuestos varía según el hecho jurídico realizado, teniendo uno u otro impuesto aparejado. Por ejemplo, a nivel de renta, se puede pagar entre el 20 o el 40% según el tramo. A nivel de capital, estaría un tipo del 33%.</p>
Italia	<p>La fiscalidad de estas herramientas en Italia sigue sin regularse. La Agenzia delle Entrate ha abordado la tributación considerándolos como otros activos más tradicionales y aplicando los regímenes fiscales pertinentes.</p> <p>Además, se puede decir que Italia ha promulgado varios decretos para mantener actualizados los conceptos e intentar añadir las tecnologías derivadas de estas herramientas a su marco normativo, como la Ley 12/2019 de conversión del DL n. 135/2018 del proyecto de ley denominado “Semplificazioni” para definir las tecnologías de registros distribuidos (DLT) como el blockchain. En el año 2022, el Banco de Italia publicó una comunicación “sobre tecnologías descentralizadas en finanzas y criptoactividades” en la que habla de MiCA.</p> <p>Respecto a la naturaleza legal y como no está abordado al completo, hay diferentes puntos de vista. Se han tratado como instrumentos financieros y algunos tribunales los han tratado como bienes fungibles. Únicamente está clara la definición de monedas virtuales que se incorporó para la lucha contra el lavado de dinero.</p> <p>Respecto al IVA y siguiendo la conclusión del Tribunal de Justicia de la Unión Europea (“TJUE”) en Skatteverket v David Hedqvist Case C-264/14, el intercambio debe estar exento de IVA. A nivel corporativo, los beneficios del comercio deben mostrarse en el impuesto de sociedades.</p> <p>Respecto al IRPF, hay que estar atento a los beneficios, y deben especificar si tienen monederos electrónicos.</p>

<b>Letonia</b>	El Valsts ieņēmumu dienests o Servicio de Ingresos del Estado letonés dice que las monedas criptográficas son un medio de pago contractual no legal. También modificó su legislación contra el blanqueo de capitales e introdujo requisitos de supervisión para los proveedores de servicios de estas monedas virtuales. Están gravadas operaciones que sean un ingreso o beneficio procedentes de las ventas de estos activos, sujeto a un Impuesto sobre la Renta de las Personas Físicas del 20% (según tramos). También las actividades ligadas a una actividad empresarial estarían sujetas.
<b>Lituania</b>	Lituania ha creado un entorno legal para el uso de estas herramientas y está ampliamente actualizado respecto a la regulación de blanqueo de capital y la lucha contra el fraude financiero. Se ha establecido que, a partir del año 2023, se deberán promulgar públicamente las empresas que quieran operar con monedas virtuales para mejorar la transparencia. A nivel general, son imponibles las actividades de minería, compra, venta, mediación y liquidación, variando el tipo de monedas/tokens y de las características específicas de las actividades, rondando una base del 15% aunque existen diferencias si es persona física o jurídica.
<b>Luxemburgo</b>	No existe un marco legal en Luxemburgo que se aplique específicamente, pero se han publicado varias advertencias o recomendaciones por parte de la Commission de Surveillance du Secteur Financier sobre las monedas virtuales indicando que cualquier prestación de servicios financieros requiere la autorización y supervisión. Una criptomonedas no es una moneda de curso legal y que tenga un banco central respaldándola, por lo que, para fines de impuestos directos, constituye un activo intangible. Hay que atender a la casuística y comprobar por ejemplo si es una renta comercial.
<b>Malta</b>	Es una isla autodeclarada blockchain con un marco regulatorio explícito para las monedas virtuales. Reconoce cuatro categorías distintas de activos virtuales: electronic money, financial instruments, virtual (utility) tokens and virtual financial assets (VFAs). Dependiendo de su tipología, estarían o no sometidos a diversos impuestos. Por ejemplo, el primero y el tercero no tienen que estar declarados en la renta, pero los dos restantes si lo estarían.
<b>Países Bajos</b>	Las criptodivisas están sujetas a impuestos como recoge Belastingdienst (Agencia de Gobierno). Son un activo imponible. Los Países Bajos no tienen impuestos sobre las ganancias de capital, sino que se tributa por el presunto incremento del valor de los activos en el mercado a 1 de enero, generando impuesto

	<p>sobre todas las participaciones a lo largo del mismo ejercicio fiscal. Se parte de la base de que se va a generar un incremento y, a comienzo del ejercicio, se seleccionan los ingresos en virtud de su origen: los rendimientos del trabajo, intereses e ingresos procedentes de activos, ahorros e inversiones. En ese tercer lugar estarían las criptomonedas de manera estandarizada, aunque es posible el pago mediante estas herramientas y que se consideren rendimientos del trabajo.</p>
<b>Polonia</b>	<p>Para el gobierno polaco, las monedas de estas características no son una unidad monetaria. Respecto a los impuestos, especialmente sobre la Renta de las Personas Físicas, los beneficios se gravan como ingresos de capital o ingresos de derechos de propiedad progresivamente entre el 18% y el 32%. A nivel empresarial está un tipo fijo del 19% aunque existen unas excepciones dependiendo del tamaño o la declaración de ingresos (del 15% o el 9%).</p>
<b>Portugal</b>	<p>El borrador de propuesta publicado el pasado octubre de 2022 para el año 2023 ha incluido nueva información sobre la tributación de estas monedas: un Impuesto sobre la Renta del 28% sobre las criptomonedas mantenidas durante menos de un año, o que las transacciones también estarían sujetas a impuestos. Así pues, como ejemplo con una venta, esta estaría sujeta al régimen de ganancias patrimoniales.</p> <p>El saldo positivo entre plusvalías y minusvalías se grava a un tipo del 28% y los saldos negativos constatados se pueden trasladar a los próximos cinco años. Las operaciones relacionadas como la minería o la validación de criptotransacciones, se consideran actividades comerciales e industriales.</p> <p>Respecto al IVA, la legislación portuguesa sigue lo dispuesto por la UE.</p>
<b>República Checa</b>	<p>Las actividades con estas herramientas no las consideran una moneda de curso legal y tampoco tienen un marco propio. Aun así, están sometidas a diversos impuestos. A nivel individual, un incremento en el patrimonio calculado sobre la base de la diferencia entre los gastos de compra y los ingresos por la venta con un tipo del 15%. El mismo procedimiento se aplica cuando se reciben pagos.</p>
<b>Rumania</b>	<p>Aunque la Agenția Națională de Administrare Fiscală (ANAF) no ha publicado unas directrices detalladas, sí que se encuentran las operaciones sujetas a Impuestos como el de la Renta. Se pagará un 10% de Impuesto sobre la Renta en cualquier aumento de capital o cualquier ingreso adicional de las actividades de inversión siempre que se supere un umbral monetario mínimo establecido. Aun así, hay actividades que están libres de impuestos como las donaciones (con</p>

	<p>excepciones), que es posible que no estén sujetas a este impuesto, aunque falta por confirmar, o también el mantenimiento, la compra o la transferencia entre carteras propias. En cualquier otro hecho imponible, como una venta, cambio de divisa por otra o un gasto en bienes o servicios, habrá que comprobar ese aumento o no del patrimonio.</p>
Suecia	<p>Según el Högsta förvaltningsdomstolen (Tribunal Supremo Administrativo de Suecia), el comercio de criptodivisas fiscalmente no debe compararse con el de divisas o valores. Las criptomonedas deben tratarse según las disposiciones sobre otros activos de la Ley del Impuesto sobre la Renta. Esto significa que la enajenación de Bitcoin debe contabilizarse como una ganancia. Por tanto, se tienen que guardar los recibos que se tengan para demostrar el importe.</p> <p>Según otros hechos imponibles, por ejemplo, no se gravan los movimientos entre carteras particulares, pero es importante tener en cuenta estas transferencias para calcular el importe correcto de los gastos. Respecto a la minería, se deben pagar impuestos sobre esos ingresos como rendimientos de servicios o como rendimientos de actividades empresariales.</p>

\*Nota: El caso español se debatirá más en profundidad a continuación.

Fuente: Compendio propio elaborado a partir de diversas fuentes (Cryptonomist, 2018; CSSF, 2018; Gazzetta Ufficiale, 2018; Cerdef, 2019; Pastor y Campuzano, 2019; Vero Skatt, 2020; Binance, 2021; Cointribune, 2021; Greekcitytimes, 2021; Gura, 2021; Nexia, 2021; Adam Smith, 2022; Bitcoinbázis, 2022; C.I. Lithuania UAB, 2022a; C.I. Lithuania UAB, 2022b; Coinpanda, 2022; Cointelegraph, 2022; CSSF, 2022a; CSSF, 2022b; Divly, 2022; Estonian Tax And Customs Board, 2022; Finančna Uprava, 2022; Freemanlaw, 2022; Global Legal Insights, 2022; Globalcitizensolutions, 2022; Greekdom, 2022; Inmigrantinvest, 2022; Integritas, 2022; Koinly, 2022; Loyens Loeff, 2022; Manimama, 2022; Money-Gate, 2022; PWC, 2022; Revenue Commissioners, 2022; RUE, 2022; Simmons-Simmons, 2022; Van Roey y Bidaine, 2022; Vero Skatt, 2022; Winheller, 2022; WTS, 2022).

Esto refleja una síntesis de la investigación actual central basada más en la vertiente temporal y el marco legal de las criptomonedas. En este caso, la idea es evitar caer o generar un problema para la comunidad de esa moneda virtual. Por tanto, se está creando una indagación y puesta de difusión de la información actual mediante la normativa, la doctrina y la jurisprudencia. Para el caso de estudio, se está tratando esencialmente el Impuesto directo IRPF que grava la manifestación más inmediata de la capacidad económica del sujeto pasivo, y una mención al IVA como indirecto. Como excepciones y debido a la

localización especial del caso de estudio durante la tesis, se está obviando entrar en detalle ampliamente en supuestos de exchangers. Ahora entrando más en profundidad en el ámbito español, se puede reflejar de la siguiente manera:

#### **1º. En el Impuesto sobre la Renta de las Personas Físicas**

Respecto al objeto, se estaría ante el artículo 2 de la Ley 35/2006, de 28 de noviembre, del Impuesto sobre la Renta de las Personas Físicas y de modificación parcial de las leyes de los Impuestos sobre Sociedades, sobre la Renta de no Residentes y sobre el Patrimonio, que menciona que es “*la totalidad de sus rendimientos, ganancias y pérdidas patrimoniales y las imputaciones de renta que se establezcan por la ley, con independencia del lugar donde se hubiesen producido y cualquiera que sea la residencia del pagador*”. Por las ganancias y pérdidas de capital derivadas de la compra y venta de un activo de este tipo (adquisición derivativa con una finalidad de invertir), el individuo debe pagar los correspondientes impuestos por la posible ganancia o pérdida de capital que se ha generado como se detrae del artículo 33. La Dirección General de Tributos, en adelante DGT, a su vez se ha tenido que pronunciar varias veces ante diversas cuestiones mediante las Consultas Vinculantes, Tabla 2, especificando que esas transmisiones a efectos de tráfico o intercambio se consideran similares a dinero.

Por tanto, se debe pagar la diferencia que existe entre el valor de la transmisión de la moneda y el valor por el que fue adquirida. En caso de resultar positivo, se inserta en la base del ahorro. Posteriormente, se deberá gravar conforme a las escalas propuestas de IRPF, específicamente a la escala a la base del ahorro. Como una aclaración, ya no es necesario que el sujeto presente el formulario 720 relativo a la declaración de activos en el extranjero puesto que no existe una ubicación geográfica exacta para el “monedero”.

Ahora, si en vez de existir una venta o compra hubiera un intercambio o permuta de monedas, respecto a si existe una ganancia, también se ha pronunciado. El valor de las monedas virtuales que se intercambian será el que le corresponda al precio en el momento del intercambio entre los sujetos. Si se origina una pérdida patrimonial, del artículo 46.b, se integraría con los límites establecidos en el artículo

Como apartado especial estaría la minería como una puntuación y como una adquisición originaria, que hace que se aborde otra cuestión que podría incluso tener su apartado propio por hablarse del IAE. El minero referido a la persona física o jurídica, para la DGT estaría vinculado a una actividad dado que la minería le aporta una compensación por el trabajo. Esto, por tanto, lo deja como una actividad económica sujeta al Impuesto sobre Actividades Económicas, pero no incluida en ningún tipo de los que posee actualmente. De manera individual, si una persona física forma parte de esta actividad y genera ingresos, está por tanto ante un rendimiento de una actividad económica. Esto implicaría también la necesidad de pedir la declaración de alta, variación o baja en el Impuesto sobre Actividades Económicas y comunicación del importe neto de la cifra de negocios a efectos de IAE.

**Tabla 2. Respeto a las consultas publicadas**

Consulta DGT de Cataluña 181/2018, de 2 de julio de 2018, en materia de ISD e IRPF.
Consulta DGT Vo808-18, de 22 de marzo de 2018, emitida por la Subdirección General de Operaciones financieras en materia de IRPF.
Consulta DGT Vo975-22, de 4 de mayo de 2022, emitida por la Subdirección General de Operaciones financieras en materia de IRPF.
Consulta DGT Vo975-22, de 4 de mayo de 2022, emitida por la Subdirección General de Operaciones financieras en materia de IRPF.
Consulta DGT Vo999-18, de 18 de abril de 2018, emitida por la Subdirección General de Operaciones financieras en materia de IRPF.
Consulta DGT V1069-19, de 20 de mayo de 2019, emitida por la Subdirección General de Fiscalidad Internacional en materia de IRNR e IRPF.
Consulta DGT V1098-20, de 28 de abril de 2020, emitida por la Subdirección General de Impuestos sobre la Renta de las Personas Físicas en materia de IRPF.
Consulta DGT V1149-18, de 8 de mayo de 2018, emitida por la Subdirección General de Operaciones financieras en materia de IRPF.
Consulta DGT V1441-22, de 20 de junio de 2022, emitida por la Subdirección General de Impuestos sobre la Renta de Personas Físicas en materia de IRPF.

Consulta DGT V1579-22, de 30 de junio de 2022, emitida por la Subdirección General de Operaciones financieras en materia de IRPF.
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Consulta DGT V2603-15, de 8 de septiembre de 2015, emitida por la Subdirección General de Impuestos sobre la Renta de las Personas Físicas en materia de IRPF.
Consulta DGT V3513-19, de 20 de diciembre de 2019, emitida por la Subdirección General de Impuestos sobre la Renta de las Personas Físicas en materia de IVA e IRPF.

Fuente: Elaboración propia.

## 2º. En el IVA

El IVA se trata de un impuesto indirecto aplicable a todo el territorio, con excepción de Canarias, Ceuta y Melilla, que “...recae sobre el consumo y grava, en la forma y condiciones previstas en esta Ley, las siguientes operaciones: las entregas de bienes y prestaciones de servicios efectuadas por empresarios o profesionales, las adquisiciones intracomunitarias de bienes y las importaciones”, art. 1 Ley 37/1992, de 28 de diciembre, del Impuesto sobre el Valor Añadido, en adelante LIVA.

En este impuesto existen diversas cuestiones, pero a efectos prácticos, el artículo 20 LIVA materializa que quedarán exentas operaciones de compra, venta o cambio y servicios similares. Gracias a la consulta vinculante V1029-15 de 30 marzo 2015 como principal, aunque han entrado más a debate, Tabla 3, se mostró que las criptomonedas actúan como un medio de pago dejándolas con su transmisión sujetas pero exentas de tal impuesto. Esto las hace ver como un medio de pago virtual asimilando una situación

parecida a la moneda legal y actuando el monedero como una cuenta bancaria. Ahora y ampliando más la información de las consultas, si un sujeto hace una compra, se debe repercutir el IVA de la transacción puesto que la persona que realiza la entrega (objeto o servicio) está obligado a ello.

Hablando del minado, la consulta a la DGT advierte que la actividad de minado no está sujeta al impuesto. Se considera que el minado no conduce a una situación de relación entre el proveedor del servicio y el destinatario. Por tanto, en la actividad de minar no hay identificados un destinatario o cliente debido a la forma en la que se crean las criptomonedas. Esto considera que no están sujetas y no generarán el derecho a la deducción de las cuotas soportadas. Es decir, al no existir un destinatario o cliente final de la prestación de ese servicio (minado), no hay a quien "emitir la factura" y no se está sujeto al IVA.

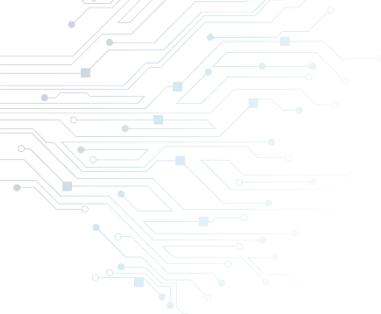
**Tabla 3. Respecto a las consultas publicadas**

Consulta DGT Vo486-22, de 10 de marzo de 2022, emitida por la Subdirección General de Impuestos al Consumo en materia de IVA.
Consulta DGT Vo915-19, de 29 de abril de 2019, emitida por la Subdirección General de Impuestos sobre el Consumo en materia de IVA e IAE.
Consulta DGT Vo915-19, de 29 de abril de 2019, emitida por la Subdirección General de Impuestos sobre el Consumo en materia de IVA e IAE.
Consulta DGT V1274-20, de 6 de mayo de 2020, emitida por la Subdirección General de Impuestos sobre el Consumo en materia de IVA.
Consulta DGT V1748-18, de 18 de junio de 2018, emitida por la Subdirección General de Impuestos sobre el Consumo en materia de IVA.
Consulta DGT V1885-21, de 16 de junio de 2021, emitida por la Subdirección General de Impuestos sobre el Consumo en materia de IVA.
Consulta DGT V2034-18, de 9 de julio de 2018, emitida por la Subdirección General de Impuestos sobre el Consumo en materia de IVA.
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Consulta DGT V2670-18, de 2 de octubre de 2018, emitida por la Subdirección General de Impuestos sobre el Consumo en materia de IVA.

Consulta DGT V2679-21, de 5 de noviembre de 2021, emitida por la Subdirección General de Impuestos sobre el Consumo en materia de IVA.

Consulta DGT V3625-16, de 31 de agosto de 2016, emitida por la Subdirección General de Impuestos sobre el Consumo en materia de IVA e IAE.

Fuente: Elaboración propia.



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