Pink Elements: Building the next-generation wikipedia of environmental data.

Michael Hank, Andreas Hammerstingl,
Alexander Pulkert, Siegfried Pleiner
Pink Elements GmbH

June 15, 2022

Technical White Paper

Version 1.30637788 (Mills' constant Version)

This Document expands the first White Paper which was elaborated jointly in a workshop with EPAM.

Contents

List of abbreviations

AML	Anti-Money-Laundering
API	Advanced Programming Interface
CEX	Centralized Exchange
DApp	Decentralised Smartphone-App
DEX	Decentralised Exchange
DLT	Distributed Ledger Technology
DRM	Digital-Rights-Management
ETL	Extraction, Transformation and Uploading
EQD	Environmental Quality Data
IoT	Internet of Things
JSON	JavaScript Object Notation
KYC	Know-Your-Customer
NoSQL	Not only Sequential Query Language
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
PE	Pink Elements
PEP	Pink Elements Platform
PWQD	Public Water Quality Data
UEDA	Unique Environmental-Data-Asset
UI	User Interfaces
URL	Uniform Resource Locator
UX	User Experience
WQA	Water Quality Association
WQD	Water Quality Data

Part I
Preface

While growing towards 10 Billion people and with global living standards on the rise, mankind is heading into an age of more densely populated cities and further increasing pollution. Climate change will impact our environment and resources significantly, including our drinking water.

We will only succeed in providing an effective response to these upcoming challenges, if we base our decisions on a profound basis of data, if we share our knowledge to accelerate our learning-process, if we bring awareness to the people and empower them to change things for the better.

Pink Elements (PE) was born to create a self-sustaining and global social platform for sharing environmental data with access for everyone. A protected space, with reliable data, transparent and secured by blockchain technology.

The following paper discloses the challenges Pink Elements will help to answer, the technologies that Pink Element will apply and the mechanisms that will make the Pink Elements network the world's largest environmental database.

Part II
Vision and Mission

Pink Elements is all about providing a platform that gets people informed, enables them to make the right decisions for themselves and their communities. Contribute, engage, organise and change things for the better.

Part III
Our future Challenges

By 2050 the earth will host 10 Billion people (+20% compared to today) [1]. 70% of people will by then live in urban areas [2].

Average temperatures will most likely have gone up by at least 1.5 °C, in some regions 2 °C (or even 2.8 °C [5]) compared to pre-industrialisation [3]. The arctic will be free of ice in summer [4]. The glaciers in the Alps will have reduced by 50% - 90% by then [5].

About 4 billion people, representing nearly two-thirds of the global population, already today experience severe water scarcity during at least one month of the year. "Nearly half the global population are already living in potential water-scarce areas at least one month per year and this could increase to some 4.8–5.7 billion in 2050. About 73% of the affected people live in Asia (69% by 2050)" [6].

Rising sea levels intruding into ground-water threaten large parts of coastal ground-water sheds [7]. Increased temperatures will promote growth of algae and pathogens in drinking water reservoirs [8, 9]. The frequency and duration of extreme weather conditions, like drought, monsoon and storms will challenge management of water resources [10]. Storm-water will endanger drinking water-distribution by flooding Megacities. Alpine regions, who have relied on glaciers as drinking water storage for summer seasons in the past, will have to re-think their water-supply [5].

Atop of having to extent water-, stormwater- and wastewater-infrastructures in response to ongoing urbanisation and climate change, cities are facing the urging need to refurbish their existing ageing infrastructures [11]. The Organisation for Economic Co-operation and Development (OECD) predicts the demand for water to increase by 55% in urban areas by 2050 [12].

> "In New York State, 10,147 regulated water systems provide clean water to 20 million of New York's citizens. Nearly 95% of New York's population receives water from the state's public water supply systems. Unfortunately, 95% of the submitted improvement projects to the Drinking Water State Revolving Fund programme remain unfunded due to the overwhelming demand. The latest estimate of repairing, replacing, and updating New York State's drinking water infrastructure is $38.7 billion over 20 years. With almost half of New York City's pipes put in place prior to 1941, it would take 100 years or more to upgrade its ageing pipes at current replacement rates. From frequent pipe breaks to large system upgrades to rebuilding from storm damages, New York State's ageing drinking water network has no shortage of challenges." [12]

Part IV

Awarness and Empowerment

According to Water Quality Association (WQA), the U.S. water industries' organisation, 51% of all U.S. citizens are at least concerned, if not very concerned, about their tap water quality. Furthermore almost half of U.S. consumers (48%) are concerned about tap water safety in their homes [13].

62% of Germanys inhabitants are afraid that drinking water quality will decrease due to climate changes. 39% feel insecure about water quality due to recent media coverage, mainly about Nitrate, residuals of pharmaceuticals and pathogens [14].

Globally 4 Bn. people actually experience living under water-scarcity [15]. Already today politics and administration are not capable of securing a sufficient supply of safe and clean drinking water, nor do they secure its quality. Population growth, urbanisation, climate change, progressing environmental pollution and ageing infrastructure will overwhelm our officials even more in future.

The availability of clean and safe drinking water quality affects everyone, everywhere, every day. Awareness about the importance of availability of clean drinking water its omnipresent, but where do we get the information we need in order to secure and improve its quality and availability? Who can we team up with to create an impact?

It is obvious that for decades politics has failed to manage drinking water infrastructure. People need to be empowered to learn about the challenges and urging needs their water supplies are facing, so they change things to the better.

Access to clean and safe drinking water is an unalienable human right. People need to get the information and means into their hands to understand, judge, communicate, stand up, organise and take action.

Part V
The Pink Elements Pledge

Pink Elements was born to create a self-sustaining and global social platform for sharing environmental data with access for everyone. A protected space, with reliable data, transparent and secured by blockchain technology.

i. **We will collect all environmental quality data available and make it accessible to everyone.**
The Pink Elements Platform (PEP) will collect Public Water Quality Data (PWQD) that is available online, starting from defined focus areas to global coverage later on. Once the PEP architecture is built to a product-release level, global roll-out will commence along most relevant cities and regions. In future, further strains of data will be included in the databases, such as weather, geology, air quality, noise, population density, or other topics.

ii. **We will support environment-related and community-driven initiatives.**

iii. **We will build a platform to create the world's biggest environmental community.**

iv. **We will provide a platform for open debate when it comes to uncomfortable truths about our environment.**

v. **We will offer everyone the opportunity to share environmental quality data.**

vi. **We will leave the ownership of data with those who provide it.**

vii. **We will pass through fees for data usage to those who own the data.**
Usage of data will be subject to a usage fee, which the owner of the data can freely determine. PE will only require a minimum usage fee for maintaining and growing PEP. Fees will be paid in Pink Token, in a simple process from and to a software-wallet.

viii. **We will store data uncensored and unmutable with the blockchain.**

ix. **We will include latest technologies to make data more meaningful.**
PE will implement machine learning to learn from changes of data in the past. PE will also connect different layers of data, such as e.g. water quality data, weather data and geological data to predict mutual influence.

x. **We will create most easy-to-use interfaces.**

Part VI
Product and Technology

1 Architecture Blueprint

The central User Interfaces (UI) and a large part of Pink Elements's User Experience (UX) is rendered by a Decentralised Smartphone-App (DApp), both for iOS and Android, in which the user can easily find and view the data that is loaded into the database by a Parser.

There are several input possibilities for data:

- through scraping of public data from websites,
- through importing from existing databases,
- through uploading by end-users or
- through Internet of Things (IoT)-sensors, which are connected to the databases through Advanced Programming Interface (API).

The data itself is stored in the underlying decentralised databases on a blockchain as well as on faster storages for processing and machine learning.

The high-level architecture for the proposed platform is presented in Figure 1 below. It is composed of four major sub-components,

- data acquisition,
- Extraction, Transformation and Uploading (ETL) ("Extract", "Transform", "Load") pipeline, aka "Parser",
- data storage and processing and
- UI (e.g. DApp).

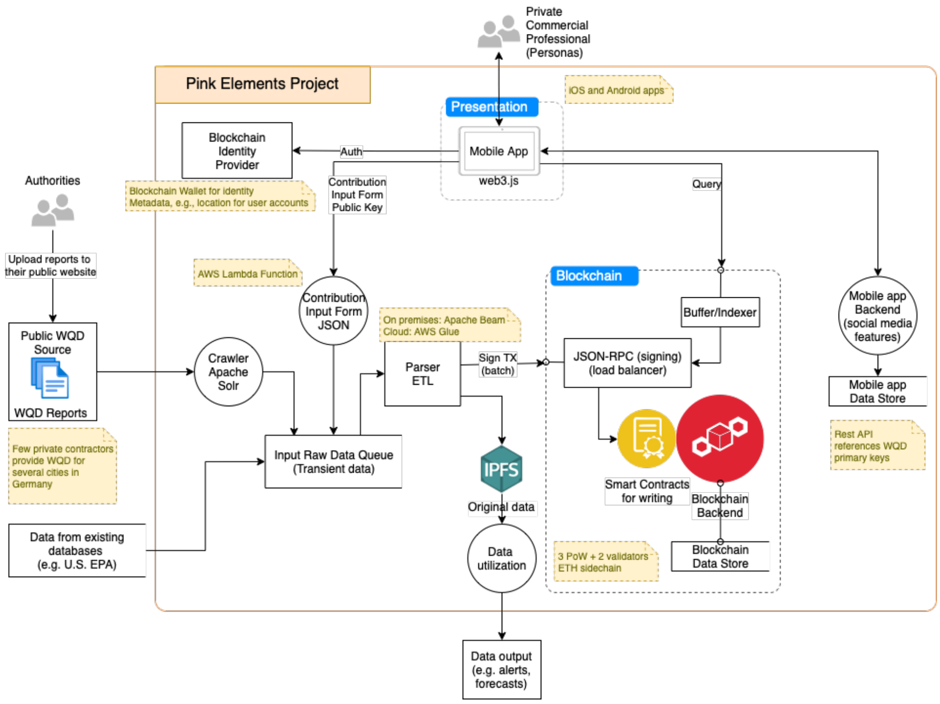

Figure 1: Archiutecture Blueprint of the PEP regarding WQD.

2 Data Acquisition

Pink Elements will initially focus on water quality data. The grid of data, gained by PE's data acquisition, must be substantially dense and has to provide data of high quality in order to become relevant to PE's users and to create promoters amongst PE's users.

Pink Elements strives to create strong promoters among its users from the very beginning. Targeted regions will therefor be carefully selected, roll-out carefully staggered.

Pink Elements is planning to amend available public data with its own data, which it will provide by taking water samples in target regions and have it analysed).

Public data

Public websites that contain environmental data are identified by PE's system by crawling the internet for sites, applying relevant key-words. Such key-words will be derived from lists containing maximum allowable contamination levels, such as e.g. the World's Health Organization's "Guideline for drinking water quality" [16].

Once a site is located, its Uniform Resource Locator (URL) is stored in PE's system, and a programmed bot called "scraper" then reads the relevant data from the website and writes it into a data pipeline on PE's system for later extraction, transformation and uploading into databases (ETL, also known as "parsing"). The crawler will be operating continuously. It will fork its legs of searching by following URLs contained on crawled sites by itself, and will such create a global network of environmental websites.

In parallel, scraper-bots will revisit every once registered website to check for available updates of previously scraped data, which then is also scraped, parsed and added to the databases.

Quality of the crawling process will be improved over time by adoption of the list of keywords applied. Searches based on keywords are language-sensitive by nature. PE will roll out its crawling and scraping process step-by-step, commencing with English language.

Private or commercial data

Privately or commercially produced data can be uploaded by everyone into the parsing-queue of PE's systems through the Pink-Elements-DApp. The DApp will provide the according functions and interfaces.

Data from existing databases

PE will further load environmental data from existing databases into the PE-system. For import of existing databases, specific interfaces and scripts will be integrated into the data acquisition process.

Data from IoT-devices

PE will implement APIs into its system so 3rd-party-devices, like e.g. sensors, will be enabled to deliver data straight into the PE system. The APIs will be usable for all Original Equipment Manufacturer (OEM), nonetheless PE will strive to include enduser-devices (smart home devices) into its services first, to include large numbers of data-points into its grid quickly.

This will also enable online monitoring of devices thru the PE platform at a later point.

Sensors for the quality of water and air can become an integral part of data-delivery into PEP. PE will promote the use of sensors for quality of water and air in private homes with its platform.

PE will also enter into co-operations to promote research & development of sensor-technology for such purposes. It will focus on two types of application:

- sensors to be applied at faucets, e.g. alike aerators and
- sensors that can be used in combination with smartphones.

Both types of sensors need to be able to communicate wirelessly (e.g. through ZigBee, Bluetooth, WiFi, LTE/4G/5G or other standards).

Also those sensors have to be affordable, fun to use, of high quality and meet premium design standards.

Technologies available today will allow us to integrate features like measuring temperature, flow or salinity of water into a first generation of sensors.

Future generations of PE IoT sensors can also include measuring concentration of bacteria and dissolved organic content. PE is planning to enter into a development cooperation with the University of Applied Sciences in Hof (Germany) regarding technologies to measure biological content in water.

3 Parser ETL (Extract, Transfer, Load)

When a new dataset appears, the ETL Pipeline is triggered to extract relevant data from the raw dataset and to load that data, including the original data and metadata like geolocation, URL and date-and-time-stamp,

i. into a fast NoSQL database, indexed by geolocation for later application of machine-learning processes and

ii. via the hash of the data into a blockchain to a new state, so the information is stored unmodifiable, decentralised and safe.

"Relevant data" will include not only all known contaminants extractable from the raw data (for water quality data the World's Health Organization's "Guideline for drinking water quality" [16] will be applied as a reference for items extracted), but also vector-parameters that allow to draw conclusions back onto environmental data (e.g. information about the raw water source, weather data and geological data).

Both parsed and original data will be assigned to an Unique Environmental-Data-Asset (UEDA), a data-identifier that connects all data allocated to a relevant asset. The smallest UEDA for example could be a faucet in a hospital and link a series of various historical WQD, it could also be an apartement block that subsumes several smaller UEDAs (e.g. WQD from various installations in the building).

4 Data Storage

To reflect the need for immutability of data, anonymity of users, and the requirements for Digital-Rights-Management (DRM) on the one hand, as well as the need for fast and flexible data-storage on the other, data is stored within two different systems:

Safe and smart data storage by the Blockchain

Original data as well as parsed data is stored on the blockchain through smart contracts, so ownership can be assigned and future transfers can be easily managed.

Having the original data stored with the help of the blockchain not only manages ownership rights, but also prevents the original data from ever being manipulated.

Fast data storage in a NoSQL database

For the purpose of utilising data, the latter has to be stored on a fast, secure means of data-storage as well. PEP will therefore store a copy of all data in a fast Not only Sequential Query Language (NoSQL) database, located on redundant servers globally, e.g. provided by *Amazon Web Services* or *Google*.

5 Data Utilisation

PEP will learn from the stored environmental data: not only will it build historical records for each UEDA whenever possible (especially for larger assets with several sub-assets), but through machine learning it will recognise trends and build algorithms, which will enable PEP to extrapolate behaviour of UEDAs eventually (similar to the predictability of indices on the stock market based on historical data).

In further steps of development, PEP will combine various layers of different data, e.g. weather data and geological data to learn from historical data how incidences on those layers influence each other and such be able to predict changes in water quality.

6 Mobile App

The mobile app interacts with the backend subsystem via a mobile app backend (e.g. Firebase & Firestore) and can transact the underlying blockchain network directly.

The App will provide the following key functions:

- Look-up of environmental quality data,
- Upload of environmental quality data,
- Community functions to interact with other users of PEP and a
- Wallet for Pink Token as well as for associated transactions.

Look-up for Environmental Quality Data (EQD)

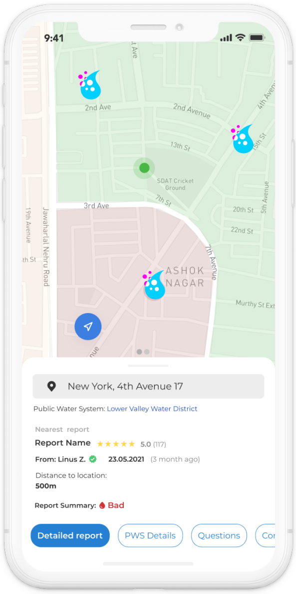

Figure 2: Home-screen of the Pink Elements App.

As in Figure 2 the home-screen of the Pink Elements App will display a map, centered to the users' location or a selectable adress. The map will show all locations, for which EQD reports are available. When clicking on a marker for an available EQD-report (the Pink Element drop), details of the EQD-report will be displayed (see Figure 3).

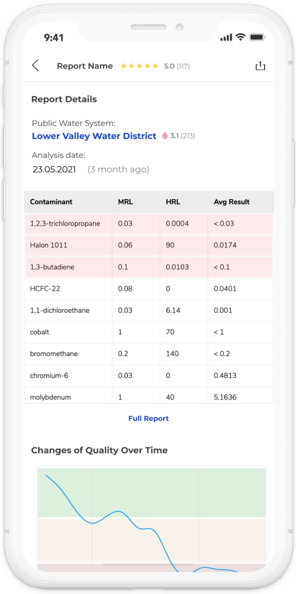

Figure 3: Detailed EQD report-data on the Pink Elements App.

Upload of environmental data and wallet

When EQD is uploaded by a user via the app, the data is transferred to the ETL-queue ”Input Raw Data Queue” (Figure 1) via a contribution input form in the JavaScript Object Notation (JSON) Format [17]. The EQD then is assigned to a unique data asset (UEDA, see above).

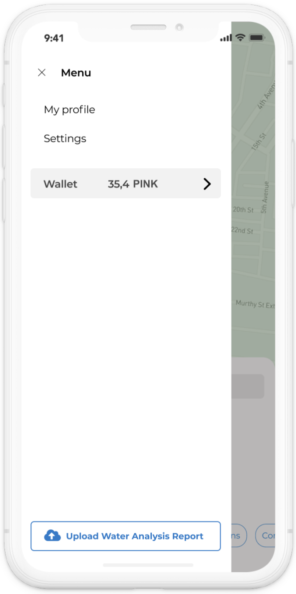

Figure 4: The menu of the DApp provides access to the upload functions and the wallet.

Communtity functions

Within PE‘s community, everyone can comment on every post, including EQD. Quality issues can be discussed, questionable data can be highlighted for feedback from the community.

Not only EQD can be rated or discussed, but also user contributions to discussions. Experts and influencers will be created within the PE community by the community.

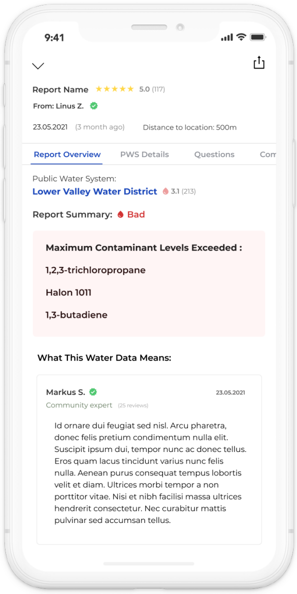

Figure 5: The community is rating user contributions, creating influencers in the community.

Space for equipment-manufacturers' ads

A user who is looking up a water analysis in a certain location can be adressed with highly matching ads by OEMs. Product advertisement could consider specific contamination to propose matching products. Such ad spaces will be much more valuable than search ads on generic search engines.

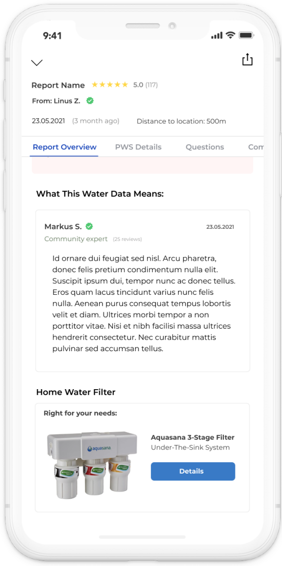

Figure 6: PE will sell premium ad space to OEMs.

Part VII
Token System

Blockchain technology forms a fundamental layer for the development of PE. On the one hand, Distributed Ledger Technology (DLT) offers significant advantages such as openness, decentralisation, censorship resistance, and a trustworthiness of the stored information, since the history cannot be changed. On the other hand the use of customised tokens as means of payment for transactions within the platform allows providers of environmental data to be rewarded for their efforts. In addition to the purchased information, the data-buyers gain access to a protected communication area where they can exchange content with the information provider and other information buyers.

1 The Pink Token

The Pink Token will be created as a payment system on PEP. The number of Pink Tokens will be set at a maximum of 1 billion.

The following uses are planned on the PEP. The Pink Token is intended to enable micropayments on PEP, the amount of which can be determined by the data providers. These payments will be provided by the data users. Of these transactions, 97% of the value will go to the data provider and 5% will go to Pink Elements.

2 Tokenomics

1 Billion ERC20 Pink Token, on the Polygon Blockchain will be distributed as shown in Figure 7:

2.1 Token distribution

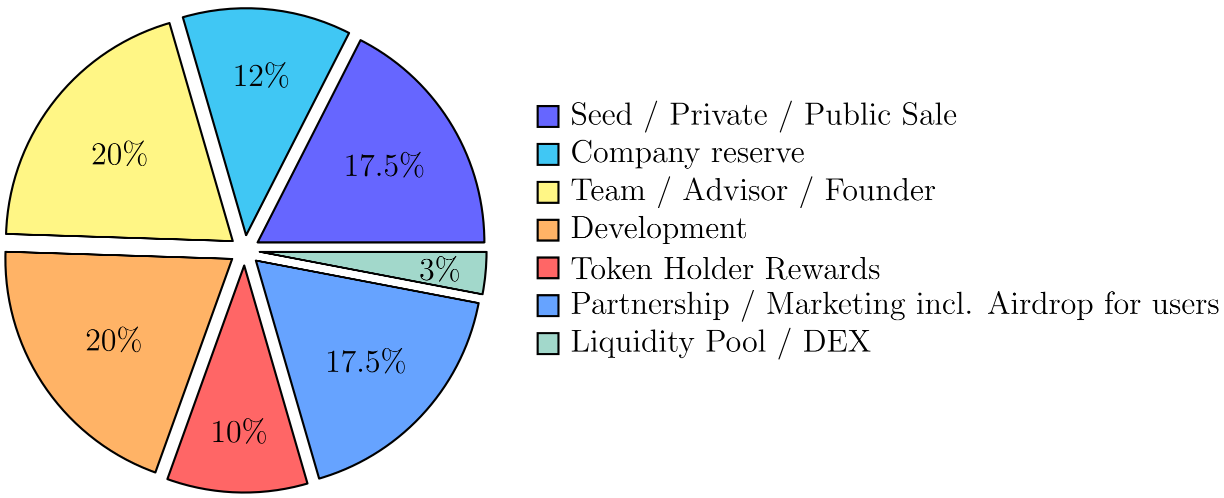

Figure 7: 1 Bn. Pink Token (total)

2.2 Vesting and Locking

According to the Figure 7 the Token of each Section will be locked / vestet as shown below.

SEED sale

% on Max supply	7,5
Allocated PINK tokens	75.000.000
Locked	12 months
Vesting	12 months
Distribution / Month	8,33 %

PRIVATE sale

% on Max supply	7,00
Allocated PINK tokens	70.000.000
Locked	6 months
Vesting	18 months
Distribution / Month	5,56 %

PUBLIC sale

% on Max supply	3
Allocated PINK tokens	30.000.000
Locked	0 months
Vesting	6 months
Distribution / Month	16,67 %

DEX listing

% on Max supply	3
Allocated PINK tokens	30.000.000

Company Reserve

% on Max supply	12
Allocated PINK tokens	120.000.000
Locked	0 months
Vesting	60 months
Distribution / Month	1,67 %

Development

% on Max supply	20
Allocated PINK tokens	200.000.000
Locked	0 months
Vesting	60 months
Distribution / Month	1,67 %

Partnership / Marketing incl. Airdrop for useres

% on Max supply	17,50
Allocated PINK tokens	175.000.000
Locked	6 months
Vesting	36 months
Distribution / Month	2,78 %

Token Holder Rewards

% on Max supply	10,00
Allocated PINK tokens	100.000.000
Locked	6 months
Vesting	120 months
Distribution / Month	0,83 %

Team / Advisor / Founder

% on Max supply	20,00
Allocated PINK tokens	200.000.000
Locked	12 months
Vesting	48 months
Distribution / Month	2,08 %

The token will be set-up as a second-layer Ethereum solution on the Polygon blockchain. Using esteblished Dezentralized Exchanges , sutch as Metamask, ore Uniswop, it will be fully compliant to Know-Your-Customer (KYC) and Anti-Money-Laundering (AML) regulation and guidelines. A legal counsellor has been involved to obtain a written opinion by Germany's Federal Financial Supervisory Authority *BaFin*, confirming the property of the Pink Token not beeing a seccurity Token.

3 Token Liquidity and Token Value

The nominal value of a Pink Token is set as follows:

- Seed Investors: 0,02 Euro
- Private Sale: 0,04 Euro
- Public Sale: 0,05 Euro

PE makes 5% of the tokens available as liquidity on appropriate exchanges (Decentralised Exchange (DEX) and Centralized Exchange (CEX)).

With the launch of PEP, early adopters of the PE Mobile App will be rewarded with token airdrops (App User Airdrop) in targeted promotions to kick-start the Pink Elements Eco-System.

Demand for additional token from new and old users can be met with fiat money through connected digital exchanges, such as Coinbase directly from the mobile app. These purchase volumes are micro-orders and start at 5 Euros/USD.

With a global roll-out of the PE platform and a growing active Pink community, the demand for Pink Tokens will increase.

The value of Pink Elements' decentralised environmental data platform will be represented by the value of the Pink Token over the long term.

References

[1] A comprehensive write-up can be found here: https://ourworldindata.org/grapher/historical-and-projected-population-by-region

[2] Original data from UN reports, but comprehensive summary here: https://ourworldindata.org/grapher/urban-and-rural-population-2050?country=~OWID_WRL

[3] https://www.ipcc.ch/sr15/chapter/spm/

[4] "Simulations suggest ice-free Arctic summers by 2050", ESA climate office 2020, https://climate.esa.int/en/projects/sea-ice/news-and-events/news/simulations-suggest-ice-free-arctic-summers-2050/

[5] "Klimaänderung und die Schweiz 2050", OcCC / ProClim, 2007, http://www.occc.ch/pdf/291.pdf

[6] "Water Scarcity", UN, https://www.unwater.org/water-facts/scarcity/

[7] "Effect of climate change on sea water intrusion in coastal aquifers", Sherif et al., Kuwait Institute for Scientific Research, https://bit.ly/3AAmuOO

[8] "Global Warming Effects on Clean Water Supply in China", Zhang et al, University of Aarhus, https://bit.ly/3zvDOTc

[9] "Impact of Global Warming on Water Toxicity: Cyanotoxins", Schonna et al., University of Texas at Austin, https://bit.ly/3hVUGMK

[10] "How Climate Change Impacts Our Water", Sarah Fecht, Columbia Climate School. Gives a good impression on how climate change will affect the U.S. https://news.climate.columbia.edu/2019/09/23/climate-change-impacts-water/

[11] "Managing water for future cities", OECD, 2014, https://www.oecd.org/environment/resources/Policy-Perspectives-Managing-Water-For-Future-Cities.pdf

[12] "Report Card for New York's Infrastructure", American Society of Civil Engineers' New York State Council, 2015,

https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/NY_ReportCard_FullReport_9.29.15_FINAL.pdf

[13] "National Study of Consumers' Opinions & Perceptions Regarding Water Quality 2019 E-Member Edition", Water Quality Association 2019

[14] "Qualität und Image von Trinkwasser in Deutschland", Institut für empirische Sozial- und Kommunikationsforschung, 2020

[15] "Water Scarcity", UN, https://www.unwater.org/water-facts/scarcity/

[16] WHO Guideline for drinking water quality", Fourth Edition, https://apps.who.int/iris/rest/bitstreams/1080656/retrieve

[17] https://www.json.org/json-de.html