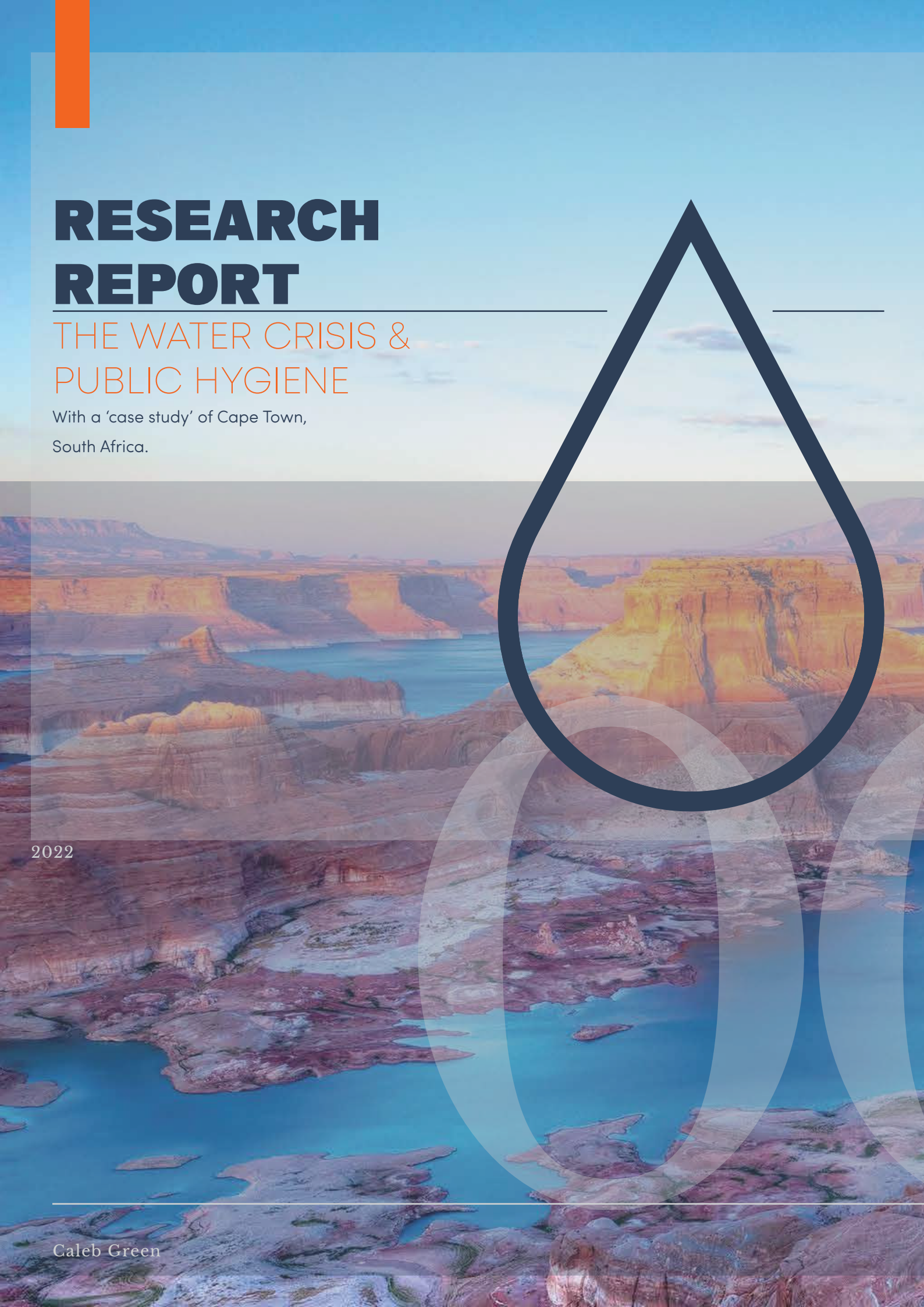
RESEARCH REPORT

THE WATER CRISIS & PUBLIC HYGIENE

With a 'case study' of Cape Town, South Africa.



2022

Caleb Green

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INRODUCTION

Summary of:

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- Report

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Design a product

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Topic: Water

Water consumption and supply

World view on water

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Cape Town, South Africa

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In the hygiene space

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Apply aesthetics

Design a branding and logo

PRESENT

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At the centre of hygiene and cleanliness, we place water. This design project looks to solve common everyday hygiene issues that centre themselves around our fundamental source of cleaning fluid; water.

Do you ever think about how essential water is to supporting your way of life? Beyond our obvious need for adequate water consumption, we also use water for cleaning, bathing, gardening, leisure and similar activities. Our easy access to water is reflected in our laziness in protecting it's use; did you know that the average American wastes up to 110L of water per day without knowing it (Washington State Department of health, 2020)? Which means that, despite your ignorance, you are one of the many contributors to the world's water crisis, which impacts millions of people who are not blessed with the same access to water that we are.

What do I mean by water crisis? The term 'water crisis' refers to the increasingly scarce supply of water; this insufficiency is significantly impacting many people throughout many countries. As a direct result of this water crisis, 1.23 million people die annually; their deaths result from a lack of access to safe water sources. Using 'unsafe' water or not following proper hygiene practices are both leading risk factors in the spread of infectious diseases, such as typhoid, polio, dysentery hepatitis, cholera and diarrhoea (Ritchie & Roser, 2019) (U.S. Department of Health & Human Services, 2022).

When confronted with this, you might ask, 'If water is so scarce, why aren't we using our oceans to supply our water needs?'. This is an appropriate question, and the answer to it is not well socialised or broadly understood. Desalination is a type of water harvesting process that filters the water, purifying it into a 'drinkable' state (CNBC, 2019). While this process is feasible to set up, it requires lots of energy to operate; so much energy, that a more efficient solution is to build a dam (DW Documentary, 2022). Rain falls in and you've got fresh water, which means that there is no need to harness additional energy to transport or purify the water (as is required for a desalination plant).

Despite the world's appetite to more effectively harness our access to fresh water through the development of facilities like dams (as displayed by China's intention to build the world's biggest mega-dam), there's no getting past the bottom line of the water crisis; global access to fresh water is shrinking (Stanway & Xu, 2020) (da Silva, 2018). This problem is exacerbated by the international focus on fuelling economic growth; water is one of the key drivers of this (DW Documentary, 2022).

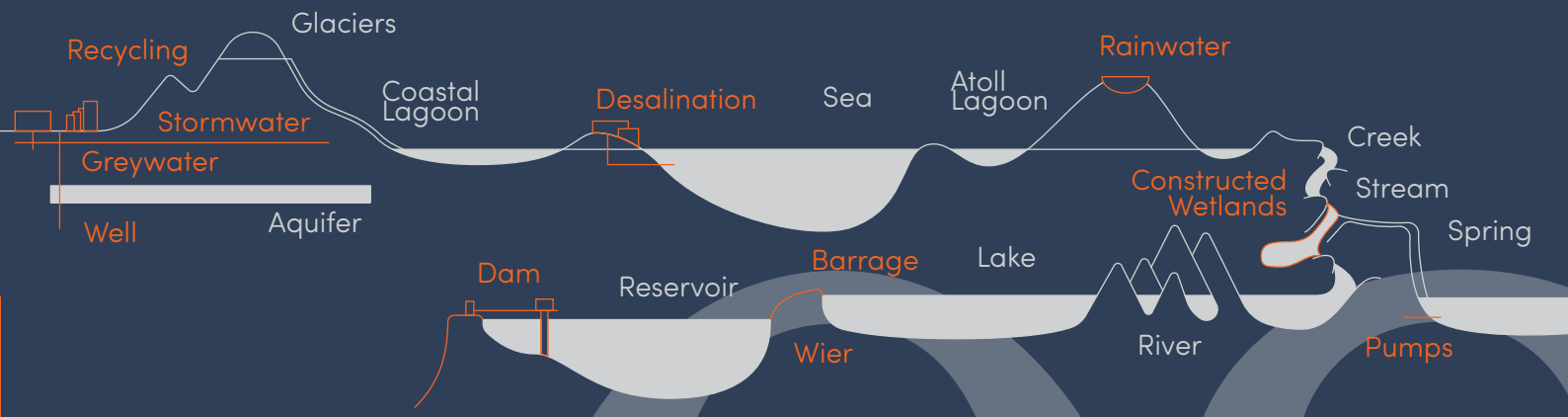
GROWTH

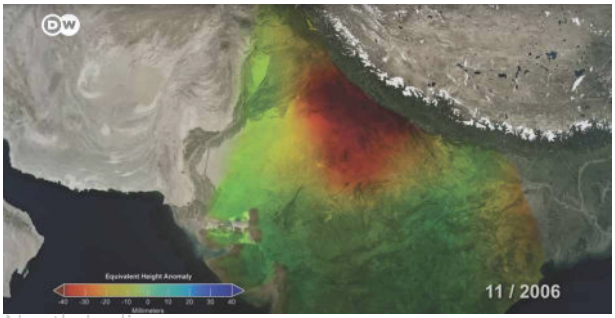
This report will not focus on how to solve the water crisis through large-scale solutions aimed at more effectively harnessing a diminishing water source; rather, it will focus on how constraining our personal 'water habits' at the individual level can contribute to improved efficiency in water consumption. To this end, the report will specifically focus on Water Sanitation Hygiene (WASH). A simple habit survey and observation will be used to gain insights into opportunities for design intervention into water habits. As said in an ABC News documentary, "It's very hard to look someone in the eye and say, your way of life may not be able to proceed" (ABC News, 2022). Why is it so hard to say that when it comes to our water habits?

WASH

LITERATURE REVIEW

Water supply and consumption in Perth, Australia,
Cape Town, South Africa, Las Vegas, California.
The 2018 Cape Town Water crisis



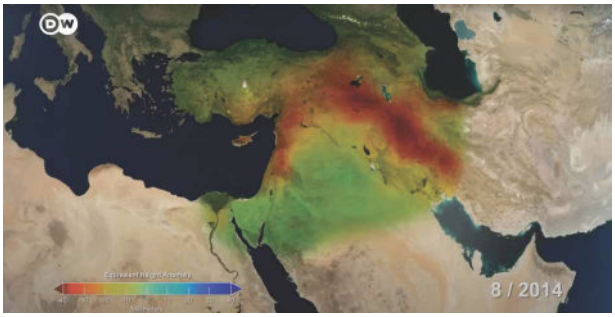


North India

Underlying the water crisis of our time is the ever-looming global warming issue. The effects of global warming are now evident and can be seen in several Dams worldwide (DW Documentary, 2022). On this page are images showing the effects of global warming in several parts of the world. (NASA, 2022)

PERTH

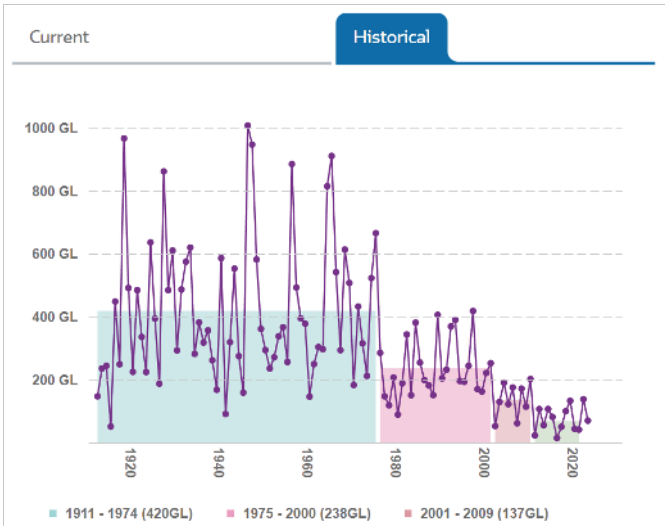
The average person in Australia uses 195L/person/day (Australian Bureau of Statistics, 2019) (Australian Bureau of statistics, 2020). Perth has been proactive in managing and changing where their water sources come from. They first started with Dams, then moved to groundwater supplies taking up 12% of the total supply in the 1960s then a further 35% by the 1980s. They also implemented restrictions when drought was not a major issue. By 2005 they had built Australia's first desalination plant. Now, 45% of the water supply at the tap is desalinated seawater, 40% is groundwater and 11% comes from rainfall & runoff. Their plan is for businesses and households to use less water by making more use of recycled water. As well, as utilizing wastewater recycling for industry, public spaces and agriculture. They have been working alongside these businesses to save water. 100 billion litres of water have been saved since 2007. Perth has been on top of its water practices and has even developed a list of water-wise products and programs for locals to utilize. The graph shows Perth's water usage since 1920. 5.4 billion litres of water were saved through the leak detection program and 10,000 water efficient heads saved 92 million litres of water in 2021 (2022 Water Corporation, 2022).



Middle East

CAPE TOWN

Cape Town, South Africa, recently went through a Water Crisis. Water from the municipal town supply was restricted to 50L per day. Fines were applied where this restriction was violated. For most people, this looked like going to the local spring every day to fill up bottles and containers of water, buying water tank systems, getting water delivered or buying it at the store. Any of these in addition to water-saving techniques in the home and the maximum allowance of 50L from the tap. The restrictions allowed for 2 x hand wash of 4L, 2 x toothbrush ues of 4L, 2min



shower use of 30 L, 1 x flush use of 6L, drinking water use of 2 L, eating or cooking use of 1L. This lasted until the Dams (the main water source to the town) were refilled in the wet season to greater capacity. The capacity in the Theewaterskloof Dam went from 100% down to 12% following a 3-year worsening drought (NowThis World, 2018). 9 inches in 2016 down to 6 inches in 2017. The problems with this drought existed in government. Separate parties exist for the local and national governments. Bickering led to inaction on opportunities for intervention presented by Cape Town to the National government (The African National Party). In effect, the poor existing water infrastructure (system and supply sources) meant a larger crisis than there should have been (RealLifeLore, 2022).

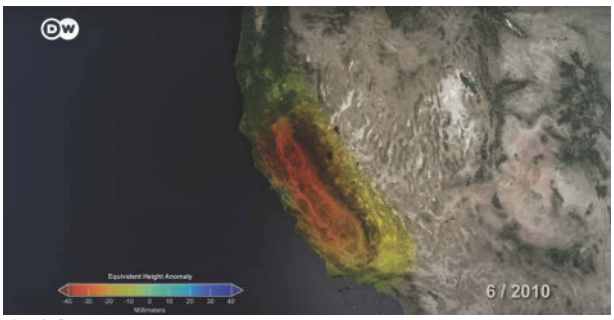
Water techniques utilized in the home by Cape town residents included:

- "If it's yellow, let it mellow, if it's brown, flush it"
- Shower every 1-2 days and no baths
- Catch running shower water for flushing toilets manually, washing dishes, cleaning benches, watering plants and the like
- Reusing clothes instead of washing them
- Wet wipes, tissues, waterless hands cleaners instead of washing hands with soap and water
- Fill up from your neighbours' boreholes or use your/neighbour's tank water

The average person in Cape Town, South Africa uses 237L/person/day (Murwirapachena, 2021). Cape Town is unique in that its population is split into 2 types of communities. Rural Townships of black people and urban western life. About 20% of Cape Town lives in these shacks, whilst 38.6% of the whole population is black. This indicates almost a 50/50 spread of blacks in poverty and out of poverty. The water infrastructure in rural townships is old and failing and the taps run dry on any given day, causing some to walk the streets for the next tap. Most township people collect large quantities of water and store it in large drums for the whole family to use. They only end up using 4% of Cape Town's total municipal supply. For anyone who lives there, electricity load shedding causes the majority of households in cape town to only have electricity at certain times of the day. Load shedding has caused other problems other than an infrequent power supply. Problems with filtration facilities mean Cape Town residents have to boil their water before drinking (Murray, 2019) (The World is One News, 2022) (Arendse, 2022) (AJ+, 2018a).

LAS VEGAS

The average hotel user in Las Vegas uses 240L/person/day and the average single-family that lives there used 390L/day in 2018 (The U.S. Census Bureau, 2017). Las Vegas has been seen as an excessive city in terms of wasting water and energy (Miranda Willson, 2019). In defence, it is one of the most conservative. All water from hotels and drains is recycled and put back into Lake Mead. As Las Vegas becomes hotter in climate and is forecast for aridification, conservation of water is forced (Spears, 2021).



California

Some programs include (Tracy, 2022):

- Incentives for taking out grass and placing desert drip irrigated landscaping
- Yards turned into gravel beds
- Fines from city authority patrols for water leaving the property and violations to watering on an unassigned day and watering non-essential/decorative grass

Only 60% of single-family households comply with year-round seasonal watering restrictions though. If it were 100%, the cut on lake mead water consumption (9.2 billion down to 8.1 billion gallons) would be less than savings in seasonal watering restrictions. 9.5 billion gallons of water have been saved by banning non-functional grass around roads, parks and walkways since. This is 10% of the total water supply. Only 2.25 billion gallons of water have been saved at facilities though. South Nevada is still undergoing a water crisis (drought) with a 170ft drop in water levels at Lake Mead over the past 20 years. The lake continues to drop and cuts are being made for Arizona and Mexico which share a portion of the Colorado River system that feeds Lake Mead (LASVEGASNEVADA.GOV, 2021).

Everyday Western Water Usage USA (AJ+, 2018b)

50-75L 8-10MIN SHOWERS

136L BATHTUB

5.6L TOILET FLUSH

13L DISHWASHER

50-75L PER SPRINKLER

423L OUTDOOR AVERAGE

RESEARCH

Archival Interview and focus groups, Cape Town water crisis

Casual 2hr Interview on water in Papau New Guinea

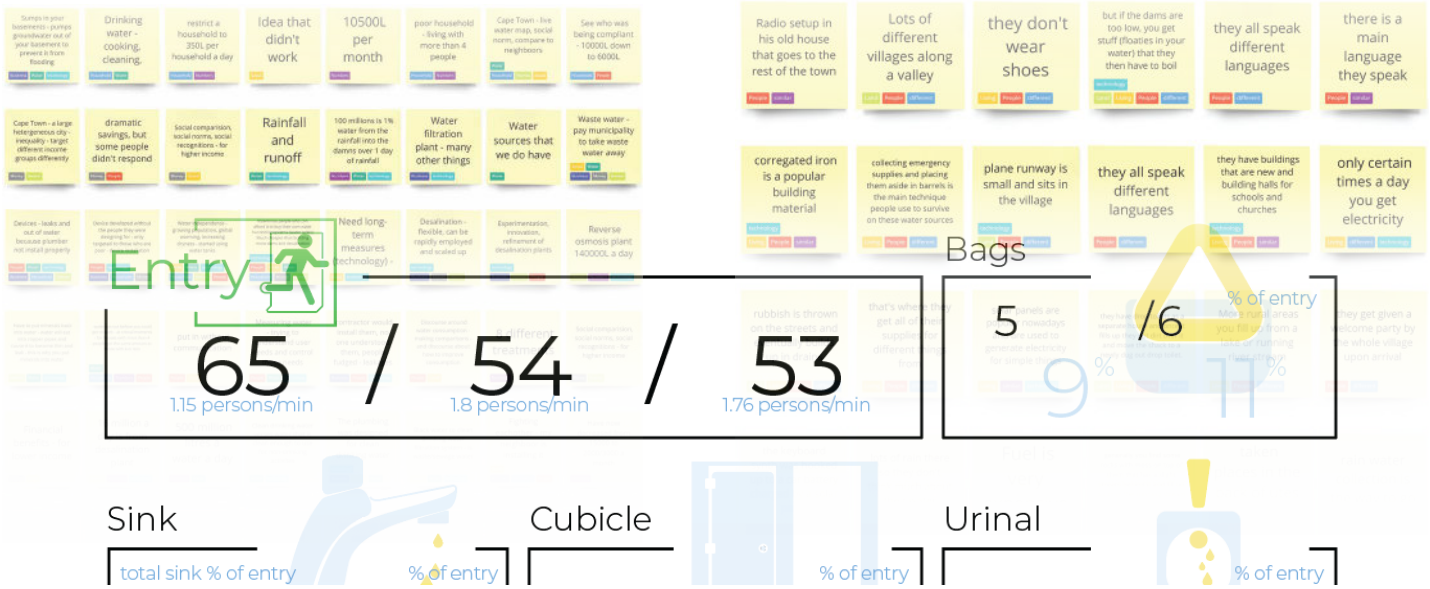
Public Toilet Observations Westfield Garden City

03

Archival focus groups on the 2017 Cape Town water crisis were reviewed. Keynotes were taken down to identify solutions and opportunities that were implemented during and after the Cape Town water crisis. The main findings were on water savings and water management on a business, household and city level. This area was investigated to identify possible solutions that can be taken and applied to a local context; Queensland, Australia. These water crisis learnings will be of significant value when designing a product that will be implemented into an existing network or system.

An informal interview was undertaken for 2hrs with someone who had personal experiences in rural Papua New Guinea and Thailand. The main points of discussion and insights were jotted down following the informal interview. Conversation coverage included: Papua New Guinea, Thailand, rural areas, electricity, survival and human basics, materials and supplies, town/village life, filling up water, urban life, what they don't do there, travel, toilets and language. This interview was done to get 1st hand perspective on rural 3rd world water and sanitation. The insights and perspectives from this interview come from long-term experience with living conditions (including water and sanitation needs) that drastically differ from the experience of a person in a 1st world country. The interview was conducted to identify possible opportunities for water filtration design in the 3rd world.

Observations in men's public toilets were undertaken at Westfield Garden City. This was done on 3 separate occasions at the same time each week to retrieve similar data and frequency of persons; recreating the same context. A similar number of persons were observed to achieve a balanced set of data to average. A sheet of paper was used to record the things people did in the toilet to identify behaviours that conform or do not conform to expected practices in our society. Public toilets were observed for a broader variety of people to get a feel for how the general public goes about hygiene and particularly, hand washing. Observing toilet facility usage helped me gain insights into sanitation practices in the western world, how this differed from the account of sanitation practices in 3rd world countries, as well as how this differed from public expectations in Australia.



ANALYSIS & FINDINGS

Key insights and opportunities

What matters from my investigation

04

Most useful, insightful notes from observations were: People come into the toilets with bags and coffee cups or drink bottles and a surprising amount of people rub their hands on their clothes even after drying them. Important statistics from the observations were:

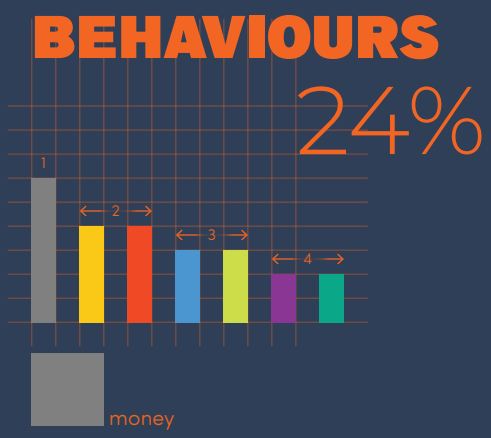
10% of entry had bags or belongings

73% of sink users used soap

30% of entry used their pants for drying

People who were using the sink without soap were potentially spreading their germs onto what they touch. People with belongings were generally putting them on the floor and collecting whatever germs might have gotten onto the ground in the bathroom. Drying hands was a problem and an easy way for anyone to fix that was to wipe on the nearest best thing; their clothes. Refer to Appendix 1

Notes from the interview were tagged with descriptions of the note. A ranking of the most to least used tags was obtained with the Miro sorting feature. The tagged notes were sorted according to the topic, then further sorted according to their tags to see which tags were most and least relevant to that topic. This analysis was undertaken to see the importance of a tag in a specific theme/conversation. From an analysis of the notes data, the most important tags for each theme were identified and are discussed below.



People and technology are primarily considered when talking about water in Cape Town, South Africa. People are foremost in management device conversations and money & scale conversations. Surprisingly, money does not show up until you start talking about behaviours and is mentioned more so than people and social. From this, we can gather that money plays a big role in changing people's behaviours. Cape Town incentivised people to buy water tanks and to change their daily water consumption. This seems to be at the core of a shift in behaviour change. Refer to Appendix 2a

People and land are important when talking about water in Papua New Guinea. People and 'different' are important when talking about village life. Materials, Infrastructure and electricity are all integrated into the water in Papua New Guinea. From the tagged rankings, technology is equally considered alongside land and living. The primary tag descriptions were people and different. From the discussion overall, it was obvious that a product design solution is not needed for problems with rural water and hygiene. It was noted that a business structure of giving part of the payment for a product, to charity is a great way to support water and hygiene issues in places like these. Refer to Appendix 2c

Refer to Appendix 2b for method

DISCUSSION

Focus on hand hygiene

Specific User group

05

High water usage and habits are unavoidable when other alternatives are not readily available. Public toilets were observed to see how many people wash and dry their hands in the western world and to identify poor public hygiene practices.

HYGIENE

Hand sanitation is important. Clean hands prevent a lot of health issues that you don't need. Hand washing is hard to accomplish with water in parts of the world and in everyday contexts where no water or soap is on-hand. Water and soap is the traditional method of hand washing. Recently, hand sanitiser has been widely promoted to battle against the COVID-19 virus. This has become a popular substitute where water and soap are unavailable on the go, such as when entering a store or a building.

SANITISER

Water has, in 1st world countries, always been affordable, and as a result, has never been seen as a valued commodity. It's not the cost of water where savings are made for the everyday person. Water-saving technologies and techniques should be considered for conserving the resource itself. One of the best ways for people to use less town water has been through water tanks. Water tanks, personal boreholes and wells are great ways for people to be self-sustaining and ease the burden on the local town water supply. Behavioural nudges were found to be particularly effective for supporting competition in maximizing the efficiency of water usage. This approach is community-led and sparks conversation between neighbours, building community motivation.

MOTIVATION

From these findings, it seems important to consider the person's everyday life; who am I designing for? It is important to design for the person and design into their life rather than design for their life. A great way to do this is to implement technology into commonly used products; this both solves a problem and adds value to how someone already lives.

DESIGN IMPLICATIONS

Wallets

Hand sanitizing

Portability

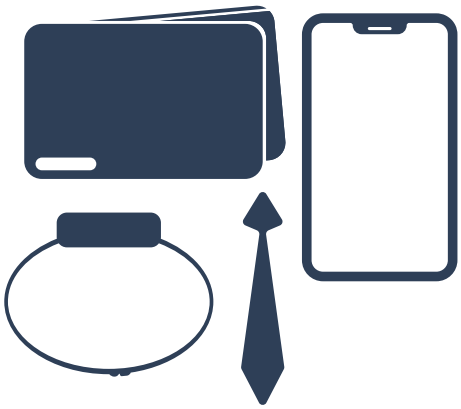
Bag Hygiene in toilets

06

The opportunity I have identified is portable hand sanitizing. There are products on the market that solve this problem, but require people to change how they live; what they put on when they go out and what they take with them when they leave. The user to design for would be a man. As a male designer, I can more easily relate to their way of life and I personally know more about their daily hygiene and water usage. The design of the product needs to be something that people take with them everywhere and into toilets; a phone, wallet, watch or clothes. By focusing on the wallet, we find that wallets are typically used only on special occasions. How many times do you take it out of your pocket? A phone, many more times. There is opportunity to make the wallet more engaging and solve a common hygiene problem (this rests as the focus, the wallet as a medium).

Research into products that solve the following issues identifies a gap in the product market that may add value. See to the right

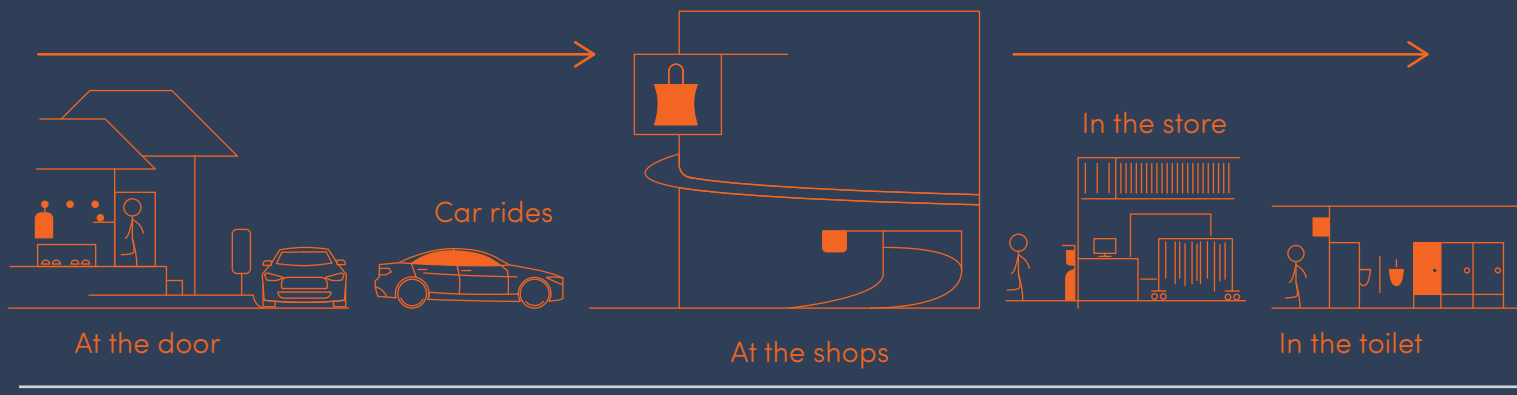
The problems: too much water or too often for washing hands or no hand washing at all. In some countries, culture and traditions hold sway over what you do with your hands. Not in the western world. There is a greater opportunity to design a product for the western environment and implement a solution into an existing system. The system I plan to implement my design into is shown below.



- NO HAND SANITIZING PRODUCTS REMOVE DIRT FROM YOUR HANDS

- DEVICES LIKE PURSE HOOKS & BAG HANGERS ARE UNCOMMON OR UNSTYLISTIC FOR MEN

- CUBICLE DOOR HOOKS PROVIDE THIEVES WITH AMPLE OPPORTUNITY TO STEAL YOUR BAG



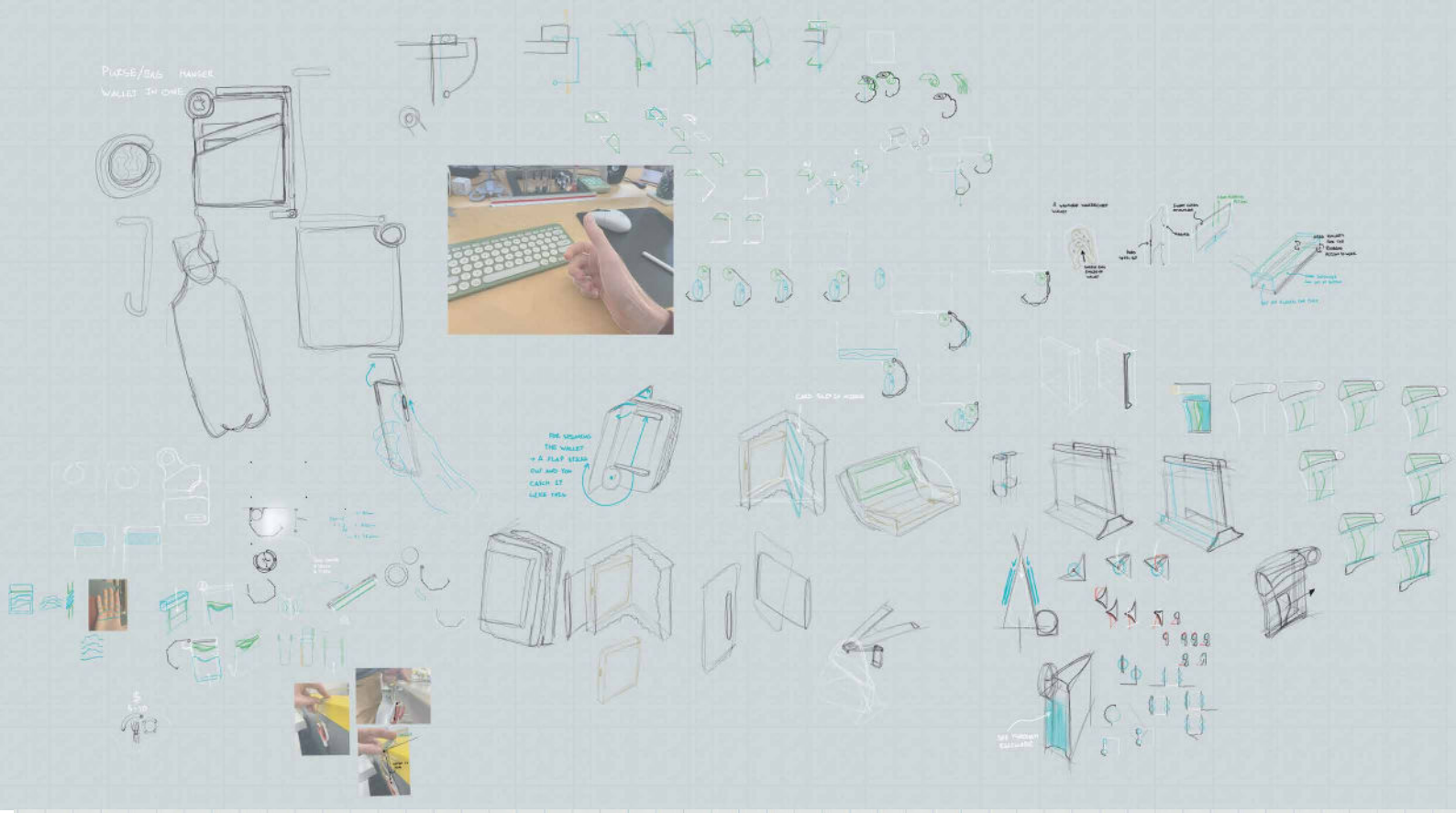
Relevant problems: Behaviours like sneezing and coughing are natural body reactions that are healthy and should occur. They become unhealthy for others when uncontained and spread. Handkerchiefs and portable tissues are great, but how do you keep germs from getting on or inside your clothes when you're done?

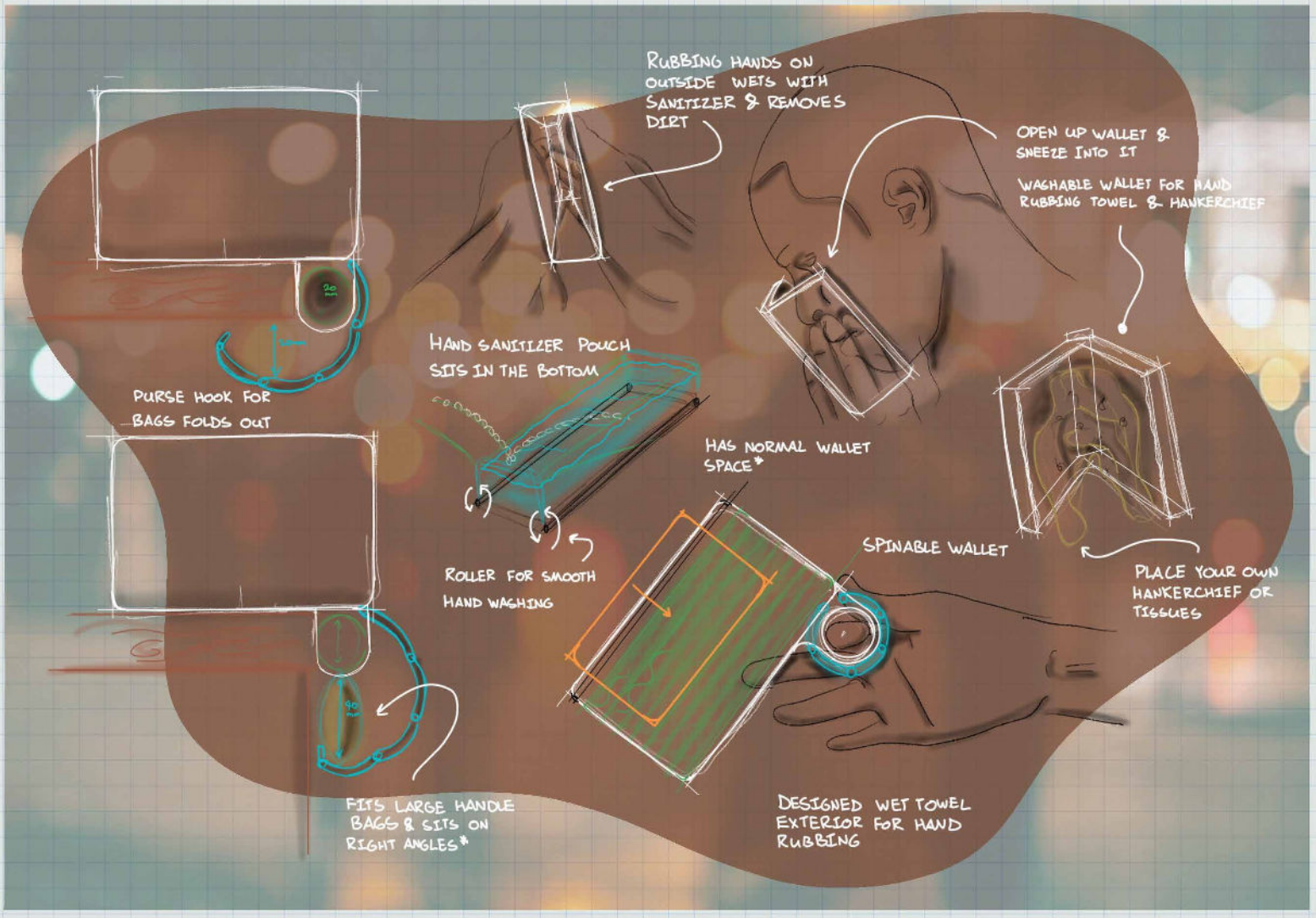
THE PRODUCT NEEDS TO:

1. HIGHLIGHT WHERE YOUR WATER FOR HAND WASHING COMES FROM
2. CONTAIN SNEEZES
3. CLEAN YOUR HANDS WITH ALCOHOL AND REMOVE DIRT
4. HOLD CARDS
5. HOLD A BAG OFF THE GROUND
6. BE PLAYFUL & USEABLE

THE PRODUCT CAN & SHOULD:

7. HOLD CASH
8. HOLD COINS
9. HOLD AN APPLE NAV BUTTON
10. BE STYLISH – LIKE A LEATHER WALLET




RUBBING HANDS ON OUTSIDE WETS WITH SANITIZER & REMOVES DIRT
OPEN UP WALLET & SNEEZE INTO IT
WASHABLE WALLET FOR HAND RUBBING TOWEL & HANKERCHIEF
HAND SANITIZER POUCH SITS IN THE BOTTOM
PURSE HOOK FOR BAGS FOLDS OUT
HAS NORMAL WALLET SPACE*
SPINABLE WALLET
ROLLER FOR SMOOTH HAND WASHING
PLACE YOUR OWN HANKERCHIEF OR TISSUES
FITS LARGE HANDLE BAGS & SITS ON RIGHT ANGLES*
DESIGNED WET TOWEL EXTERIOR FOR HAND RUBBING

CONCLUSION

07

83<88G	INDOOR WATER USE
1.2<1.6G	WATER EFFICIENT TOILET
10G	SHOWER HEAD FLOW REDUCER
2.5G/MIN	KITCHEN AERATOR
112<213L	OUTDOOR USE

g = gallons = 3.79L

Water consumption in households is 20% of total freshwater withdrawals in Australia (Australian Bureau of statistics, 2020). Adrian Grenier (a reporter in the documentary The Vanishing River: USA's Mega Drought) made the above changes to his water usage, which reduced his daily water consumption by 30%. If every USA citizen followed his footsteps, 8.5 billion gallons of water would be saved daily – this is more water than flows through the grand canyon each day (ABC News, 2022). If every Australian did this, the volume of total freshwater consumption in Australia would decrease by 6%.

By looking at water consumption, it becomes clear that change needs to happen where a human behaves. Humans behave or interact with water at the tap/sink, shower head, bath, toilet or garden hose. This design project will focus on improving sanitary practices in public bathrooms and at public taps/sinks in, specifically targeting public hand-washing practices.

There isn't a proper solution for hand washing outside of the home. If we continue to rely on public toilets and shops as the only parties accountable for providing hand sanitising and hand washing facilities, public hygiene practices will remain sub-par. It's never mentioned what you do once you've sneezed. Let it dry? Some people are proactive with pocket handkerchiefs and women or men can carry tissue packs in their purses/man-bags. However, not everyone wants to carry around or use those things. An appropriate analogy is the 'broad-brimmed hat wearers'. Not many people would look at a broad-brimmed hat as the epitome of fashion; however, people wear them because they want to take care of their skin. If a hand-sanitising product can be designed to be both functional and fashionable, public uptake of this product will increase, leading to better public hand-washing practices.

Returning to the quote "It's very hard to look someone in the eye and say, your way of life may not be able to proceed"; why is this the case? It's because personally, my habits are no different. It takes a courageous step to start that change of habit. Being aware of where your food, water and products come from, makes people more conscious about the decisions they make. A person who is unaware of their behaviours at the sink will be unaware of how the water got there. Highlighting where the water comes from in this design will be beneficial in raising public awareness of the problem, which is the first step in every change (Sudbrink, 2015). The design plans to provide a waterless solution for the user to wash their hands. Buying this device will be the first step in changing other water behaviours.

APPENDIX

Appendix 1 - Observation Tally Sheet

Appendix 2 - Interview Graphics

Appendix 3 - References

08

Entry

57 participants avg. @ 1.57 persons/min

Bags

10% % of entry had bags

Sink

90% % of entry used the sink

25% % of sink users only gestured

Properly

Gesture

Cubicle

48% % of entry used the cubicle

Urinal

43% % of entry used the urinal

Flush

74% % of cubicle users flushed

EXIT

Soap

'Used soap'

73% % of sink users used soap

8% % of soap users only gestured

Properly

Gesture

Mouth

'Spit, wipe nose, wipe mouth'

8% % of entry touched their mouth

Hair

'Touch hair, touch face'

10% % of entry touched their hair

Clothes

Pants or shirt used for drying

31% % of entry used their pants for drying

Dryer

Properly

86% % of hand washers dried their hands properly

Gesture

10% % of hand washers gestured

ARCHIVAL NOTES

Themed rankings

MIRO GROUPING

MANAGEMENT DEVICES 22% of conversation

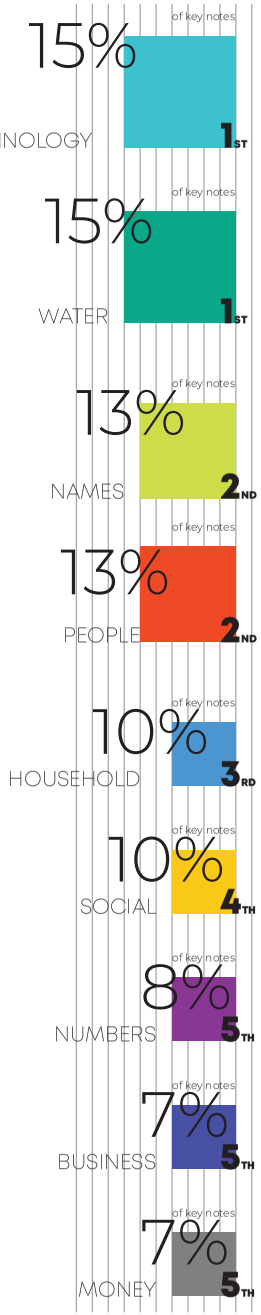
BUSINESS SOLUTIONS 25% of conversation

MONEY AND SCALE 29% of conversation

BEHAVIOURS 24% of conversation

Tagged rankings

PERSONAL GROUPING



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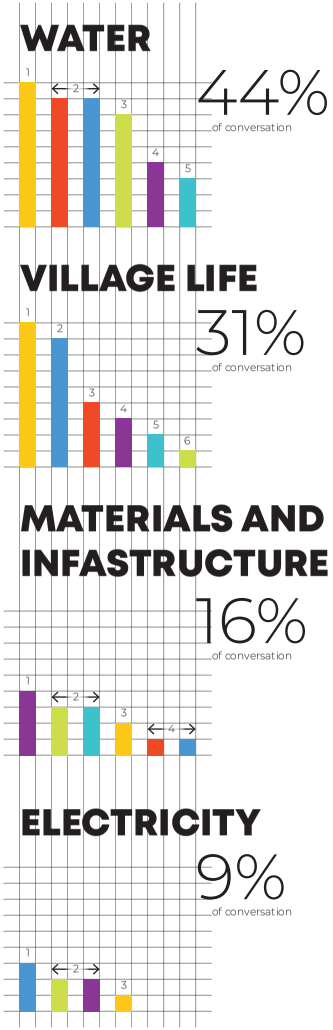
INTERVIEW NOTES

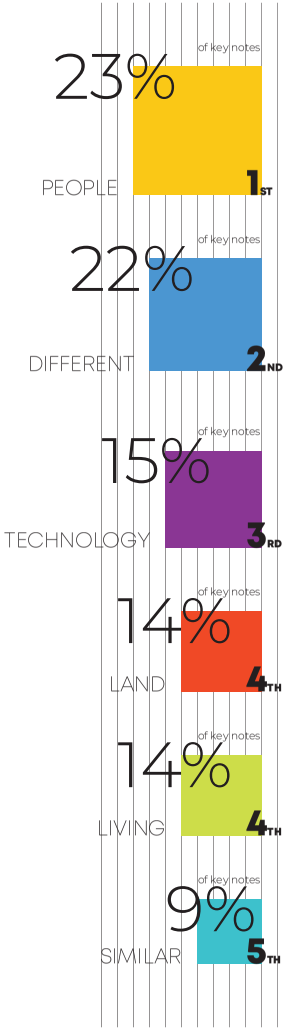
Themed rankings

MIRO GROUPING



Tagged rankings

PERSONAL GROUPING



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