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Doziert durch Margarete von Lupin  
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Suitable materials for tropical regions

## **How to improve the longevity of a product designed for the tropics**

Geeignete Materialien für Tropenregionen

## **Wie man die Langlebigkeit eines Produktes für die Tropen verbessert**



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*Translations from German into English were done by the author with support from DeepL.*

## Ausgangslage

Wie oft musst Du Deinen Dosenöffner ersetzen? Wie oft kaufst Du eine neue Mikrowelle? Und wie oft gibt es einen neuen Türgriff an die Hauseingangstür?

Sofern dies nicht mindestens alle drei Jahre der Fall ist, wohnst Du vermutlich nicht in einer tropischen Region.<sup>1</sup>

In der Schweiz als langlebig geltende Materialien wie Stahl, Holz, Textilien oder Kunststoffe, kommen in tropischen Regionen an ihre Grenzen. Das Klima ist extrem - der Anforderung sind vieler. Objekte aus jeglichen Materialien müssen, nebst dem hohen Salzgehalt in der Luft, auch starken UV-Einstrahlungen, Regenfällen, Temperaturschwankungen, tropischen Stürmen und Hurrikannen bis zu Erdbeben standhalten.

Ich beobachte, dass Alltagsgegenstände, welche man in der Schweiz bei sachgemässer Behandlung jahrelang nutzen kann, in den Tropen

innert wenigen Monaten kaputt gehen.

Gebiete am Tropenring gehören zu den weltweit finanziell schwächsten Ländern. Um langlebige Produkte herstellen zu können, müssten jedoch belastungsfähigere und somit oft auch teure Materialien oder Verarbeitungsverfahren eingesetzt werden.

Die Thematik ist aktuell und brisant. Wie die James Cook University Australia in „State of the tropics 2020“<sup>2</sup> berichtet, wird bis 2050 rund 50 Prozent der Weltbevölkerung in Tropenregionen leben. Die Langlebigkeit der Materialien ist dabei heute schon für den Lebensstandard von rund 40 Prozent der Weltbevölkerung relevant.

Schon bald stelle ich fest, dass sich keine Literatur zu (Industriedesign spezifischen) Materialien für die Tropen finden lässt. Dass Materialien unter dem Klima typi-

scher Tropenregionen leidet, lässt sich hingegen<sup>3</sup> bestätigen.

Um die Problematik aus der Sicht betroffener Menschen analysieren zu können, habe ich Interviewtermine mit zwei Experten aus Puerto Rico vereinbart. Zusätzlich konnte ich mich regelmässig mit der schweizer Honorarkonsulin vor Ort austauschen und eine kleine Zerfallstudie mit Objekten aus dem Haushalt betreiben.

In die Recherche zu dieser Thematik bin ich mit folgenden Fragen gestartet:

1. Welche Materialien können zur industriellen Produktion genutzt werden?
2. Was ist bereits über die Problematik bekannt und was geschah aufgrund dieser Einsichten?
3. Ist es möglich, tropenklimateauglich zu produzieren?

<sup>1</sup> Interview-Frage Nr. 10 im Gespräch mit V. Garcia und Nr. 8 bei D. Fresse (2020)

<sup>2</sup> Expanding tropics will play greater global role, report predicts, SCIENCE, von Allie Wilkinson (2014)

<sup>3</sup> Deterioration of materials under tropical conditions, T. L. Webb, J. H. P. van Aardt (1959), mehr dazu im Fazit

## Initial Situation

How often do you have to replace your can opener? How often do you buy a new microwave? And how often do you put a new door handle on your front door?

If this is not the case at least every three years, you probably don't live in a tropical region.<sup>1</sup>

Materials that are considered durable in Switzerland, such as steel, wood, textiles, or plastics, reach their limits in tropical regions. The climate is extreme - the demands are many. Objects made of any material must withstand not only the high salt content in the air, but also strong UV radiation, rainfall, temperature fluctuations, tropical storms and hurricanes, and even earthquakes.

I observe that everyday objects, which can be used for years in Switzerland if treated properly, break within a few months in the tropics.

Areas on the tropical ring are among the world's financially weakest countries. To be able to manufacture long-lasting products, however, more resilient and thus often more expensive materials or processing methods would have to be used.

The relevance of this topic is increasing. As James Cook University Australia reports in „State of the tropics 2020“<sup>2</sup>, by 2050 around 50 percent of the world's population will be living in tropical regions. The longevity of materials is today already relevant to the standard of living of around 40 percent of the world's population.

I soon discover that no literature can be found on (industrial design specific) materials for the tropics. That materials suffer from the climate of typical tropical regions, on the other hand<sup>3</sup>, can be confirmed.

To be able to analyze the problem from the perspective of affected people, I arranged interview appointments with two experts from Puerto Rico. Besides, I was able to communicate regularly with the Swiss honorary consul on-site and conduct a small decay study with objects from the household.

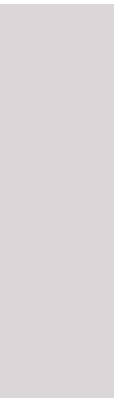
I started my research on this topic with the following questions:

1. What materials can be used for industrial production?
2. What is already known about the problem and what happened as a result of these insights?
3. Is it possible to produce in a way that is suitable for the tropical climate?

<sup>1</sup> Interview question No. 10 in the interview with V. Garcia and No. 8 in the interview with D. Fresse (2020)

<sup>2</sup> Expanding tropics will play greater global role, report predicts, SCIENCE, by Allie Wilkinson (2014)

<sup>3</sup> Deterioration of materials under tropical conditions, T. L. Webb, J. H. P. van Aardt (1959), more about this in the summary



## Interview mit Vladimir Garcia

Vladimir ist der Chefdesigner bei Armada™, einer unabhängigen Produktmarke und Designagentur mit Sitz in San Juan, Puerto Rico. Er erwarb einen Bachelor-Abschluss in Umweltdesign an der Universität von Puerto Rico und einen Master-Abschluss in Architektur am Southern California Institute of Architecture (SCI-Arc). Bevor er Armada™ im Jahr 2007 gründete, hatte er in verschiedenen Architekturbüros in Los Angeles und San Juan gearbeitet. Für seine Arbeiten wurde er vielfach gekührt, so wurde er zum Beispiel für das United States Artist Grant Nominiert und erhielt mehrere Einladungen zur Teilnahme an der Biennale of Ibero American Design. Zusätzlich durfte er Puerto Rico bei der ersten zeitgenössischen lateinamerikanischen Designausstellung New Territories<sup>4</sup> in den USA vertreten. Im Jahr

2018 wurde sein Produkt Meteoro Teil der ständigen Sammlung des Museums für Kunst und Design in Miramar, San Juan. Seine Designprojekte wurden in renommierten Kunsträumen wie der National Gallery (San Juan), dem Design Central im Madero-Madrid, dem Architecture + Urbanism Museum / A+U in Los Angeles und dem Museum of Arts and Design, New York City, sowie auf Designmessen wie WantedDesign während der New York Design Week ausgestellt. Seine Arbeiten wurden international in online Design-Publikationen wie Inhabitat, Design Milk und Yanko Design sowie in Zeitschriften wie Details, Dwell und Metropolis veröffentlicht. Vladimir beteiligt sich aktiv an der lokalen akademischen Szene als Professor, Kritiker und Do-

zent. Derzeit lehrt er im Department Industriedesign der School of Visual Arts and Design wo er auch die Leitung des des Departments innehält. Weiter ist er Mitglied der Design-Fakultät an der Polytechnischen Universität der PR und der Päpstlichen Katholischen Universität der PR Schools of Architecture. Institutionell ist er Mitglied des Verwaltungsrats des Mayagüez Creative Business and Industries Incubator, Puerto Ricos erstem Unternehmensinkubator-Programm für die kreativen Bereiche.

Das auf den nächsten Seiten folgende Interview wurde auf Englisch geführt und ist in einer leicht überarbeiteten Fassung wiedergegeben.

## Interview with Vladimir Garcia

Abb. 1: VLADIMIR GARCIA,  
Screenshot from the interview  
held via Zoom, 2020



Vladimir is the Chief Designer at Armada™, an independent product brand and design agency based in San Juan, Puerto Rico. He earned a Bachelor's degree in Environmental Design from the University of Puerto Rico and a Master's degree in Architecture from the Southern California Institute of Architecture (SCI-Arc). Prior to founding Armada™ in 2007, he

had worked in various architectural firms in Los Angeles and San Juan. He has been widely recognized for his work, such as being nominated for the United States Artist Grant and receiving several invitations to participate in the Bienial of Ibero American Design. Additionally, he was privileged to represent Puerto Rico at the first contemporary Latin American

New Territories<sup>4</sup> design exhibition in the United States. In 2018, his product *Meteoro* became part of the permanent collection of the Museum of Art and Design in Miramar, San Juan. His design projects have been exhibited in prestigious art spaces such as the National Gallery (San Juan), Design Central in Matadero-Madrid, the Architecture + Urbanism Museum (A+U) in Los Angeles, and the Museum of Arts and Design in New York City. Further his work has been exhibited at design fairs such as

<sup>4</sup> New Territories: Laboratories for Design, Craft, and Art in Latin America, Museum of Arts and Design, NYC, 2015



Abb. 2: PLANTING VESSELS SERIES,  
Armada™, Powder-Coated Aluminum,  
and Glazed Ceramic, 2013



WantedDesign, during the New York Design Week and has been featured internationally in on-line design publications such as Inhabitat, Design Milk, and Yanko Design, as well as in Magazines such as Details, Dwell and Metropolis. Vladimir participates actively on the local academic circuit as professor, critic and lecturer. Cur-

rently he teaches at the Industrial Design Department of the School of Fine Arts and Design of PR, where he is also appointed as Department Chair. He has also held positions as member of the design faculty at the Polytechnic University of PR and the Pontifical Catholic University of PR Schools of Architecture.

Institutionally he serves as member of the Board of Directors for the Mayaguez Creative Business and Industries Incubator, Puerto Rico's first enterprise incubator program for the creative fields.

The interview that follows on the next pages was conducted in English and is reproduced in a slightly edited version.

#### Source declaration

Personal description of V. Garcia taken from his website

## Interview

**1. According to studies (Deterioration of materials under tropical conditions, 1959), the material decomposes faster in the tropical belt than in other regions of the world. You live in Puerto Rico, a tropical island. Does this topic concern you?**

Every day. We work with materials and we do constructions so it's an issue that's always present. And in terms of the weather here, it's brutal. The thing that affects most the materials is the change of the composition of the molecules due to our weather. The durability and the toughness of the material are essential for whatever we design. If it's inside or outside doesn't matter because the humidity is everywhere so if it doesn't get damaged by the rain or destroyed by the wind of the hurricanes it will get rusty on the inside because you have humidity and sea salt everywhere because we are so close to the coast pretty much everywhere on the island.



Abb. 3:  
PUERTO RICO,  
Google Maps,  
Screenshot,  
2021

*So even if you're on the inside of an apartment with the AC on all day long you will be affected by this problem?*

Yeah, it doesn't matter. We use a lot of metal because it's also a cultural thing. After all, it's a material that is well known here and we have people who can work it out very well. So every time you use metal, you have to address that with a coating that you choose to, either it is a paint-like urethane, polyurethane, or even if it's a pa-

gina... Some materials don't need to be coated, because they have their natural coats, like brass or bronze. Their patinas tend to become really strong, because, you know the patina is a reaction of the material to the weatherization. When you use that kind of material you know how it's going to weather. It's not ugly like rust.

*Does this mean that whenever you're using metal you keep in mind how it will develop due to the weatherization?*

## Interview

Yeah definitely. Then also the natural patinas of the material become very strong. Sometimes, in other climate zones, those patinas are very soft. In our climate, they change to an extreme. The first thing you want to do with the material is to protect it from the decade. And then for the finish, to be also aesthetically appealing.

**2. Is the choice of material an issue for you in connection with longevity? Do you think the durability of everyday objects ge-**

**nerally spoken is important or not so important?**

Yes, it's very important. In an area like this, where we have sustainability issues and we are trying to make more durable and long-lasting things that should be a must. Nowadays that should be the norm. Products should be created and built to last as a first thing. And if you want something to be built to last you need to choose the best materials. So yes!

*How about wood. Is weatherization an issue too?*

Yeah, yeah, yeah, yeah, yeah... it's not as aggressive as it is with metal, but still, it kind of is. We have to protect the wood from rotting. It lasts kind of longer, the only thing that will destroy it faster, is not a climate or weather thing, it's the termites. You have Teak Wood that is a wood that is used on boats, that are mostly for those exterior purposes and it's a wood that will last forever in the exterior, even if you finish it without protection. But then you have something like pine that is a softwood, it will get damaged very easily. Softwoods are sweet for termites to eat. Once you get termites in your woodwork, that's done.

*You say termites don't eat Teak Wood, do they in general not go to tropical or hardwood?*



Abb. 4:  
INSECT INFESTATION,  
Mortar made of tropical  
wood (type unknown),  
Lisa Ladner, 2020

## Interview

Well, there are some hardwoods that termites don't bite. But most of them aren't safe from termites neither. On some woods like ausubo (Manilkara bidentate, "bullet wood") and purpleheart (Peltogyne), they start doing it but kind of stop after a while. You can find traces in those really hard woods, but they apparently stopped because it's just not right for them to eat. There are chemical repellants but you could also use natural finishes like some mixes of linseed oil which helps - it's kind of a natural insect repellant.



Abb. 5: PLASTIC OBJECT  
(type unknown), light damaged,  
Lisa Ladner, 2020

*What about plastics?*

I was just addressing the typical like wood and metal, but let's talk about everything a little bit. Ceramics will get kind of yellowish in the sun. Not everywhere but at the edges of the pieces. Glass: you don't have that kind of problem with glass and everything glass-related. Plastics, plexiglass included, and every kind of polyurethane-related product, get damaged by the sun's UV rays. Depending on the composition it will just start getting kind of pulverized. It becomes like sand! Some plastics are very resistant, of course, they are, but the sun is what damages them the most. It eats the color and the coverings of the plastics.

*But in regards to the object, which has been built by these materials, you can say that the object gets destroyed?*

Yes, the performance of the object definitely gets affected. And

if we're talking about the value, some people value the aesthetics more than the object itself, so if the aesthetics are broken, it's just not „functional“ for them anymore. It's aesthetically where you see the weatherization in the material first and then the functionality gets compromised so on.

**3. Which five materials do you find most suitable for the construction of everyday things? With what material do you prefer to work with and why?**

Aluminum because of what? Of the weather! I don't like to use carbon, like carbon steel. Because it just gets rusty in a second. So I prefer to do everything in aluminum. I don't like the quality of stainless steel, it's a hard material, it doesn't bend very easily, it cracks, the workability of the material, I also don't like that much, and then I don't like the aesthetics of the stainless steel. I like to use

## Interview

cementitious materials, also because of their durability. I like ceramics too. If they are very well fired, they can withstand time. And the wood of course! In all the manifestations of wood.

There is wood from here, from the Caribbean, it's called Blue Mahoe (*Hibiscus elatus/Talipariti elatum*) and it's not blue actually it's a kind of purple, purple and grey like sand. It's a very beautiful wood. And it's very contextual to our parts, to our geography. It's not long-lasting as Teak or the other I have mentioned earlier, but it performs very well.

*So for what kind of object would you use it for?*

For interior works only. I choose woods in terms of durability. We don't have as many woods available here, because we import everything. So in the material selection, we try to aim at a product,

but then we need to have a plan B and C because we just don't have it available. If it's for exteriors, definitely I would choose the most durable woods, I would choose between those available with the aesthetic I like the most. That's how it is. At least here. In our conditions.

**4. What I don't understand is, that in some of your stores, e.g. Ikea, furniture gets sold (and bought), which are produced in the same way as ours and which cannot meet the climatic requirements. What do you have to say to this?**

We all know Ikea, and everybody loves and hates Ikea. Some of their products are really good, a small fraction of them. I have some chairs, which I bought from Ikea maybe 5 years ago, Designed by the Studio From us with Love, and they are beautiful. It's a byproduct of plastic and wood. They are a

very durable, beautiful, and well-designed and build product. So I cannot speak badly about that product at all. I love it. But then you have that typical Ikea thing that you just assemble and then, once you move it from the place you put it the first time, it just gets all shaky and that's it. IKEA uses a lot of aluminum and they use a lot of coatings on the steel if it's steel, so those products don't get damaged that much by the weather. But what gets damaged easily, are the MDF products. They can't withstand our humidity and weather. That's their weakness. Their products made out of plastics react the same like plastics do everywhere, every day if they are exposed to the sun and the conditions we just bespoke earlier.

**5. Do you think that a lot of things are sold locally that cannot withstand the climatic conditions?**

## Interview

Things are not designed in terms of a context. They never are. It's not that they shouldn't but the market doesn't allow that to happen.

*Why?*

Because of the design in terms of functionality and the market. If you are buying furniture for the exterior, of course, that will be designed for the exterior. But they don't design furniture for the tropics or furniture for the north. They don't design in terms of those specifics, they address functionality issues and in those terms, they address the issues that the furniture is going to be outside, they don't design for the amount of temperature, the amount of sun, snow, or rain, they don't take that into consideration.

*Those products will "survive" our sometimes snowy climate much better than the climate in Puerto Rico.*

I don't have that knowledge of the snow, because I've never lived in a place with a lot of snow. I live in California and that doesn't count. Objects are designed based on a market and to address basic general functions. They don't differ in terms of dryness, humidity, salt content, wind, amount, and intensity of sun... They are not designed for those specified, they are designed for generalities. And they are also designed for a market in a capitalist world, they just want to sell. So we get those products here, it doesn't matter if they are good or bad, we just buy them because it's just that what is available. It's not designed by us for us.

*About 40 percent of today's population lives in the tropics.<sup>5</sup>*

Yeah, but you know our work is a niche. We are independent designers. Our products don't get sold in Ikea so even though we have a concern and we address it, we

won't get to a larger audience. What gets to a larger audience is whatever store sells in the US. Again, availability is an issue. Because we are an island. And hey! That's an issue for us as a designer every time as well. Availability of materials, services, specialists, and people! Because then we are small as well! That's another theme but I want to be clear on that. Our market is small, which means that our custom-designed pieces for the tropics if you want to put it that way, won't have the reach that the other markets do. And then the markets that have the reach, not all of them, are not well-designed pieces that will fade with the weather. If you buy a lamp here and it has a chrome finish, that chrome lamp is beautiful but it will only last you a year here. It just gets rusty and all crackly. So it's a beautiful product which may be in a place without this weather will last. I don't know, but I assume.

## Interview

*Yes, it would definitely!*

Considering your statement (that 40 percent of the world population lives in the tropics) it would clearly be awesome if such a market would be taken into consideration. But it's not like that. Even if they should take it under consideration. We are looking into an area where we have to address sustainability as a main issue for design. Building things that are meant to last and that can be repaired.

I teach my students that they should be designers that build things to last. Beautiful things, durable things, and things with meaning. You have to create things conceptual meaningfully for people to get more attracted to them. I mean it's not an issue of material per se it's an issue of how you get people to relate to the product and make it, that they want to keep it. And of course, it should be built out of durable materials. You need

to have a really good base material but then everything else should be of the same quality too. You can have a very nice piece of surface material, but if you use cheap hardware, like screws, metal loops, pieces of wire,... those additional components will start the decomposition and you're gonna have the same problem, they will decay or get ugly.

### **6. You are a professor at the School of fine arts of Puerto Rico. Are your students focusing on this subject?**

Everybody here is. Once you put something - even if it is was built for the exterior - outside, you will see the change dramatically and in less than a month the product starts getting dull, it just changes. So yes, everybody is aware of the conditions and they design according to that all the time. We talked a lot about the rain and humidity, but the sun is an issue here too.

The sun crackles the wood, discolors the plastics, and as I told you the ceramics as well. It brings heat! And the change between heat and cold is what starts the composition in materials. It gets crazy hot here. And then suddenly, rain comes. And gets everything cold. Then, half an hour later, you have the sun out again and two hours later the thing is as hot as it was. The paint gets damaged by these factors as well. You have to choose carefully what paint you choose for the materials. Powder coating works best in terms of creating that solid bond, urethane paints, the one they use for cars and stuff, works as well. Less than powder coating but they do well. On wood or, concrete-based products latex paint performs nice but you have to recoat the thing often. But all of those paints need to be reapplied every 2 or 3 years.

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**7. What went wrong with the promenade “Paseo Puerta de Tierra” that was built in 2016? Is this a typical, representative example, or was it a building mistake. How would you have done it? Is it even possible to build durable buildings at this location? With which materials?**

Well, let me tell you about this project particularly. That’s not a regular steel. That’s corten<sup>6</sup> steel. Beautiful brownish when new, because the material itself is rusty. But the designer did not take into consideration that this material is weak by its own composition. And then they put that material right

in front of the sea which accelerates the decomposition of that material exponentially. Further, they didn’t consider that everything that touches that kind of metal will get rusty too. You can see it on the concrete, the rust got transported with the water and affects it. It’s a beautiful material,



Abb. 6+7: PASEO DE PUERTA DE TIERRA, corrosion and decay, Lisa Ladner, 2020

| Interview with Vladimir Garcia

<sup>6</sup> Corten steel is a brown-orange steel. The coloration is due to the self-protecting rust layer that naturally forms over time. Once it has matured, this layer of metal oxide is called a „patina“. Corten steel is a metal that changes over time under the influence of atmospheric conditions.



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but you have to know how to use it. It's a design-based problem. It was a bad selection of the material. I would have used aluminum for that location instead. Not even stainless steel. Because if they use an alloy with a lot of carbon on it, even if it is stainless steel it will get rusty. In such a place I would deal with paint and things to be able to protect it even more. Even aluminum needs to be protected. Not everyone likes the aesthetics of aluminum so sometimes I use powder-coated aluminum, or in that case, maybe powder-coated steel would work too. The problem with powder coating is... Powder coating is a process in which you use an oven. So you need to build something small enough to fit in that oven. Big things need to be built in a way that they can be put apart, powder coated, and assembled back together. You can't use powder coating if you haven't designed it.

### **8. During my last trip to Puerto Rico I noticed that a lot of Styrofoam and PVC gets used.**

PVC is really toxic. One of the worst plastics and it's very popular here. It wasn't like that always. You couldn't have boards of PVC, like a board of plywood before. But a few years back the industry started giving out PVC boards. So now, everything that was made out of plywood gets made out of PVC. Why? Because of termites. Of course, it has good durability and it's a cheap product. A good board of plywood is way more expensive. It's about economics as well. We are a poor country you have to consider that. The economy is a big factor in terms of design. So people are using PVC like crazy but the material is a health problem. Once it's been cut or worked out with machinery it produces toxic vapors. And it's leaching these vapors for the

whole life of the product. For us here, where we live with windows constantly open, it might not be much of a big deal, but if you use that material up north, where you are, and you have the doors closed, you would be exposed to a harmful lot of toxic vapor. Styrofoam gets used a lot for disposal products here. It's a very American way of living. New York is covered with Styrofoam—everything, from coffee to burgers, it's crazy. It's just a really really really really really bad thing. They could do that out of cardboard. But again, foam is really cheap. Cheaper than cardboard. In Puerto Rico, none of those two materials can be recycled. The sustainability issue on the planet is an economics-based problem. It's a capitalist world. And that's how it works. That's why the whole planet is just like burning with all kinds of climate issues. It's a system that doesn't care about anything but them. The profit.

## Interview

*What kind of plastics would you use?*

I don't like plastics as a designer, I know they can have very good characteristics but in my practice, I don't use them. If I were to use them I would use plastics number 1 (PET) and number 2 (HDPE). These plastics can get easily recycled here. If I had to choose plastics I would choose them due to their qualities. That's why they have different plastics, all have different qualities. But I would only choose a plastic of which I can control the afterlife of the product. In Puerto Rico, we only recycle numbers 1 and 2. So that's why I would use them.

**9. Which three objects annoy you most that you have to replace them all the time?**

That's a good question. My electronic devices only last for two or three years, and then I have to throw them. The salt in the air destroys them from the inside. From microwaves to TV to computers... I didn't use guarantees on electronic products before, but now I add the most powerful guarantee for everything I buy. I know they will break down sooner or later. I'm sure that's because I live nearby the beach, but it's bad construction too. Something else that I have bought about 100 times in the last 5 years is can openers. I have bought maybe 10 of those guys in the last 5 years. And they are made out of metal, they are supposed to be tough since you have to open cans with them. I try to buy good ones, I buy the most expensive ones, but even though they break. What material they are made of? I'm sure

it's the cheapest alloy, but they are made out of ferrous materials, they should be stronger.

**10. Would you know of specific literature about industrial design and the tropics?**

Literature about Industrial Design in Latin America, that's a whole. That's hard to find. There is a publishing house in Mexico. Look for Dr. Oscar Salinas Flores. He is an architect and industrial designer from Mexico at UNAM, the most prestigious University in Mexico City. Oscar Salinas publishes his works in that publishing house. He's the one I have seen the most. All our other books are in English, we get books from America and England, but not many from Spanish speakers. There is a magazine called "Experimenta" in Madrid,

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they have a lot of books and magazines regarding design. Maybe you can find something there. I haven't seen a book addressing that issue of tropics and industrial design, maybe you can find something about Latin America and Design.

*So how do you teach your students? Just from your own experiences?*

Well, I don't know which books you use, but there are not many textbooks to teach design. I teach by using essays, personal practice, experience, and by doing exercises of course. There is a lot of literature in terms of historical movements for the history of design class. There is literature about the production of materials and manufacture methods too. We build depending on approaches. The material can be used as

a base or we take social, economic, or cultural approaches. We can point them out by specific essays, of which most are written by non-Latin American people.

*How come?*

In terms of research and publishing, it doesn't work like in Europe here. We don't get funded. When you don't get money to do research or to write, you won't get books.

The book of Bruno Stagno is a classic. If you're addressing materials, you can rely on architectural books regarding tropics and materials, because architects use the same manufacturing products as designers, they know materials, and their materials have to perform really well. Maybe you won't get an answer to all of the materi-

als you're looking for, but you will get some answers in terms of the tropics and how materials perform. Just last week, the Bienal Iberoamericana de Diseño took place. It's the most recognized design forum in which the best designs from whole Latin America, Portugal, and Spain get presented. Besides being a biennale it's an academic forum, in which experts give lectures for a whole week. From gender quality to the design of products and graphics to everything. Our design community got large because of them. With some exceptions, for example, Colombia which has a lot of specialized manufactures, pretty much everybody is on the same boat. We are in Latin America, it's a poor continent, very diminished by colonialism from day one. It's only now that we are trying to emerge,

## Interview

but still, nations are on development and our conditions here are very limited by that in all aspects.

This condition permeates to design: how people use things, how people buy things, what the market role models are... They always look north, they look to America, it's crazy because they are the worst. Consumerism, capitalism, all crazy. So you have to position yourself in this context to understand the repercussions of these things. Things don't happen in a vacuum, they happen in a context.

In the biennale, they were doing a presentation regarding publication and research. And they were all complaining about the same things: Lack of funding, lack of organization, and lack of a structure that can conglomerate that

knowledge base to be able to take it to the next level. All the investigations and researches that happen are funded by the private sector. It's not like how it happens everywhere else, if not academics

are the ones doing the researches, the research won't get open to the public.

*When visiting the Museo de Arte y Diseño de Miramar MADMi in Puerto*



Abb. 8+9: ¡BASTA!, Armada™, Chess Set, Bronze Casting, Resin, MDF, 2018

## Interview

*Rico I noticed that many designers take references to their cultural heritage.*

We as designers always follow Europe. It's the capital of design, the industrial revolution happened there. I'm very aware of what is happening in the US and Euro-

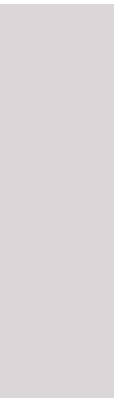
pe. Maybe not that much of what is happening in Asia. Regional language is defined by materials available in place and manufacture methods known in that place. They are trying to develop that language in terms of aesthetics and terms of modernity. You have

something done in a way in the past and now you try to do the same thing in modernity and try to see what comes out of that. Design is a growing field in developing countries. Even if Industrial Design is pretty new. Before, the only designer known were architects and maybe a few fashion designers. Only after, the graphic design started happening, fashion design got more popular and now you have product designers, interaction designers... Design is getting expanded as a discipline because of the necessities. But our country doesn't have the money to invest, we don't have industries that support the disciplines. We are pretty much all independent designers, doing our products as entrepreneurs. We don't have Nike or Apple that recruits our students and give them work. So that's the condition here and those conditions develop a different result in terms of how the discipline flourishes.

¡Basta! (Enough) bluntly inquires the islands' lack of political hegemony and its status as the very last colony in the world.



Thank you.



## Interview mit Doel Fresse

Doel Fresse gehört zu den erfahrensten und preisgekrönten Produkt- und Möbeldesignern in Puerto Rico. Sein Hintergrund in Architektur und Design hat es ihm ermöglicht, Entwürfe für urbane und häusliche Möbel, Spielzeuge, Objekte und Installationen zu entwickeln.

Er hat einen Master-Abschluss in Design von der Parsons School of Design, New York, und einen Bachelor-Abschluss in Umweltdesign von der School of Architecture der Universität von Puerto Rico, Campus Rio Piedras.

Derzeit ist er als Dozent und Professor an der School of Visual Arts and Design von Puerto Rico und als Kritiker in den wichtigsten Design-Institutionen des Landes tätig.

Seine Arbeiten wurden in Puerto Rico, New York und Madrid ausgestellt. Für sein Design wurde er mehrfach ausgezeichnet, so erhielt er den Urbe Award, den PPG Appreciation Award und wurde für das US Artist Fellowship nominiert. Zusätzlich gewann er den ersten Platz beim internationalen Designwettbewerb The Future of

Shade. Darüber hinaus hat er an mehreren Messen und Biennalen teilgenommen, wie der Wanted Designmesse in New York und der Ibero-Amerikanischen Design Biennale.

Das auf den nächsten Seiten folgende Interview wurde auf Englisch geführt und ist in einer leicht überarbeiteten Fassung wiedergegeben.

## Interview with Doel Fresse

Doel Fresse is a experienced and award-winning product and furniture designer in Puerto Rico. His background in architecture and design has enabled him to develop designs for urban and domestic furniture, toys, objects and installations.

He holds a master's degree in design from Parsons School of Design, New York, and a bachelor's degree in environmental design from the School of Architecture of the University of Puerto Rico, Rio Piedras Campus. He is currently a lecturer and professor at the School of Visual Arts and Design of Puerto Rico and a critic in the most important design institutions in the country. His work has been exhibited in Puerto Rico, New York and Madrid. He has received several awards for his design, including the Urbe Award and the PPG Appreciation Award. Further he was nominated for the US Artist Fellowship.



Abb. 10: DOEL FRESSE, Screenshot from the interview held via Zoom, 2020

Additionally, he won first place in The Future of Shade international design competition. He has also participated in several fairs and biennials, such as the Wanted design fair in New York and the Ibero-American Design Biennial.

The interview that follows on the next pages was conducted in English and is reproduced in a slightly edited version.

### Source declaration

Personal description of Doel Fresse taken from his website



## Interview

**1. According to studies (Deterioration of materials under tropical conditions, 1959), the material decomposes faster in the tropical belt than in other regions of the world. You live in Puerto Rico, a tropical island. Does this topic concern you?**

It does, deterioration happens really fast here. Not only because of the weather itself, hot and rainy, but also the humidity affects a lot of the things that we have, either outside or indoor. It requires a lot of maintenance and you know this is something we are not really good at culturally. Right now in the city, in Santurce (the largest San Juan neighborhood) you see a lot of run-down buildings. Mostly because of the financial crisis we have right now, and that situation we have with the US<sup>7</sup>. People abandoned their properties and that's happening more and more. Now plants have grown inside the

buildings, and everything grows very fast here. *(laughs)* It's kind of Mother Nature takes care of everything really quickly. So yes, it's a topic that is very important and I take it into consideration every time I design.

*Okay and you do this as an architect but also as an Object Designer?*

Yes definitely. Right now I'm looking at my ceiling fans. They were made out of metal and will rust really easily. Things made out of compostable materials like furniture made out of wood, will get affected by the weather and humidity of the place too. Air conditioning will create condensation will increase the problems for those materials. If you have a piece of furniture made out of chrome for example you will have to treat it constantly with oils to make it last.

So yeah, it is a problem for things like that.

**2. You are a professor at the Escuela de Artes Plásticas y Diseño de Puerto Rico. Are your students focusing on this subject?**

Theoretically. I speak a lot about that, but in terms of making prototypes, I don't make it a requirement because it is expensive to use materials like aluminum and they are also more difficult to work with because we don't have the right facility to weld aluminum for example at our university.

*What other kind of materials get used by them?*

They do a lot of 3D-Printing (PLA and ABS) but in terms of furniture mostly wood gets used, especially plywood panels, carbon steel and stuff like that.

## Interview

**3. As an industrial designer and creator of all kinds of objects, you have probably dealt with many materials in the past. Which materials do you find most suitable for products sold in Puerto Rico? What do you prefer to work with?**

I love aluminum, it's great because it's really easy to manage, lightweight, and very durable in this weather. There are many types of finishes you can apply. I like to use black oxide. It looks great with that kind of finish! In terms of fabrics, I like „Sunbrella“. It's expensive but very durable. I use a lot of galvanized steel too - painted galvanized steel, it can also be powder coated. However there is always a debate here, some say that carbon steel will last longer. But what I have seen, is that carbon steel gets more rusty on time and the galvanized one, even if the paint comes off, can just be repainted and will last longer.

*Do you use this indoors and outdoors?*

Usually, this gets used outdoors. I do more small architecture interventions in existing buildings than furniture. And there I would use galvanized steel as I think it lasts longer and it is cheaper than aluminum - that's the balance you always need to keep here. So I go

for aluminum or galvanized steel.

*What material did you use for the architectural project Helicon?*

That was made out of „Sunbrella“ textile and aluminum. I won that international competition for a building envelope. This was an idea for curtain wall buildings, where international companies

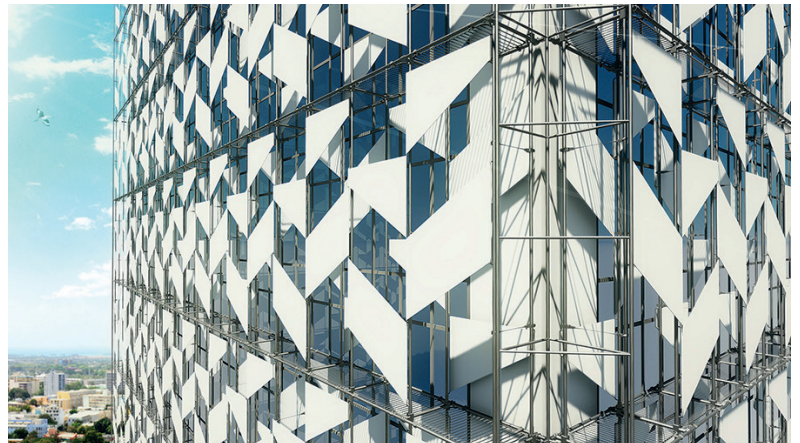


Abb. 11: HELICON, concept, a sun shading system for existing buildings in the tropics, Doel Fresse, 2015

## Interview

want their corporate look here, but at the same time, they have all this glass where the sun comes in and it makes it very unsustainable. So the idea was to sort of retrofit or adapt the surface to make it efficient and cover it in a way that there is less need of air-conditioning on the inside. The additional idea was that it can collapse toward the inside and resist the winds if a hurricane comes.

**4. For the rocking chair BAN-DA you write that you made the chair out of aluminum so that it is lighter but also more durable than its predecessor which was made out of steel. Is this a conscious decision for longevity or what aspects were the main ones?**

It is actually a conscious decision. I have seen that the design of the original chairs got lost, because people just throw them away and this creates a lot of metal waste

too. I didn't want that to happen with the chairs that I was designing. I wanted to bring that chair to the next century. And that was one of the ideas: to make it lightweight and to make it more durable in terms of time. I always mix the ideas of the use of architecture and the use of the furniture itself. I did want to bring that feeling of

a balcony chair back, I want to encourage people to use their balconies, which is an idea that we are losing more and more in terms of architecture. People tend to close their balconies with windows, to replace it with an air-conditioned room, which I think is stupid, because we have the tropical weather that I think is great! I like the idea



Abb. 12: BAN-DA, rocking chair, aluminum, Doel Fresse, year unknown

## Interview

of promoting the use of balconies and terraces with this type of furniture and some other objects which I'm actually designing right now. They all have to do with the idea of keeping doors open or having cross ventilation. This climate condition gives us possibilities which makes us unique in a way in terms of architecture. It's a condition you need to love.

### **5. Is longevity of objects important or not so important in your opinion?**

It's always a debate in my head. I like the idea of durability because it is sustainable. You have these objects be passed on from one generation to the other, I like that idea. I like to use long-lasting materials for my objects. But I think it depends on the type of object that I am designing. Sometimes I like to use wood - and wood can be

something that will not last long without the proper maintenance and treatment.

*But it depends on the wood no? Aren't you at the source of tropical hardwoods?*

Actually tropical wood is hard to find at our stores. Usually, it is brought from other places. Teak (*Tectona grandis*) for example comes from Costa Rica, and I think they have that sustainable labeled (FSC) type of wood. We also have FSC maple, pinewood and bamboo panels in our stores. The problem with FSC is, that they are more expensive and will make your product more expensive. Will you be able to sell it? Is this something that people will understand? Will they take sustainable issues into consideration or not? This is something you have to think about as a designer. Here, if you have a very expensive object it will pro-

bably be hard to compete against cheaper products made of cheaper materials.

We are in a consumer society where people think the cheaper is better, even though the quality is not as good. We live in a society where people don't mind throwing things away. Which is very similar to the American culture in that sense. Most people are not that conscious of the environment and the damage that they do to the environment. You have to educate people, from school age and on I guess, to have that consciousness about the environment and let them make better decisions about buying stuff.

**6. When I was in PR last time, I noticed that some food trucks around my mother's apartment replaced their disposable plates of Styrofoam with something made out of paper or cardboard.**

## Interview

**So I noticed a kind of rethinking. Do you see this trend in your general culture, maybe among your students, or not at all?**

People are changing especially in that sector of consumption that is more frequent and where they don't get affected by the prize so much. People, I think, are willing to pay a little bit more for food of better quality. The idea of consuming products that are healthier for yourself and connecting that to the environment is growing. People get exposed more to healthy and organic food then 10 years ago and I think this changes people's minds.

*So they started switching to more organic and sustainable products if it is related to their own health.*

Yes exactly.

**7. What I don't understand is, that in some of your stores, e.g. Ikea, furniture get sold (and bought), which are produced in the same way as ours and which cannot meet the climatic requirements. What do you have to say to this?**

Well I mean, I guess, to make furniture durable is not convenient in many ways in a capital system like this. The finishes, the materials, everything will be more expensive. Also they want to appeal for the international market. If they would have a line for the tropics, that would be great. But they produce what will work „everywhere“ instead.

*This would be a great idea. Why do not some of those stores have such a line for the tropics? Is there any store which sells really high quality, long-lasting furniture in Puerto Rico?*

Not that I would have seen. That would be great. I mean it would be great if you could manage to lower the cost of the productions and materials. *(laughs)* and have a good quality product which can compete to other products on the market. That would be the best case scenario. But it's hard, most of the materials you get here have to come from the US and fall under special taxes and fees. That makes it very difficult to lower production prices in Puerto Rico. Things that get produced here are very expensive. We are an island and receive everything from the outside. It makes it even more expensive as we have to use the US-Navy Ships for importation - the most expensive one in the world. If something comes from China we first have to<sup>8</sup> ship it to the US and only then, with US boats we are allowed to import them to the island.

<sup>8</sup> It falls under the „ley de cabotaje“, an agreement made with the US where they charge taxes for everything that comes to Puerto Rico, and says that everything has to go through the US shipping system.

## Interview

*If you produce something by your own, do you have to sell it under a special tax?*

Yeah we have to. If you have a store or something like that you have to collect the IVU (Puerto Rican Sales and Use Tax), this is a tax over an object. If you're selling something to a specific person just like that you might or might not collect those taxes.

*Well but then I guess it's illegal...?*

Yes exactly (*laughs*).

*How about American company which sell their products on the island?*

Well some American companies have incentives. Big companies like Walmart, usually have such an incentive and pay less taxes to the government.

**8. Which three objects annoy you most that you have to replace them all the time?**

Well one of them is metal furniture, they don't last long. You have to replace stuff like metal hinges, hardware and door knobs really often. Ah and gardening tools get rusty reeeaaaal quickly! I have to replace them really frequently and they are hard to maintain.



Abb. 13: DOOR LOCK, affected by rust, 2020

*...and you need them a lot since everything grows so fast as you said earlier!*

Yes exactly!!!

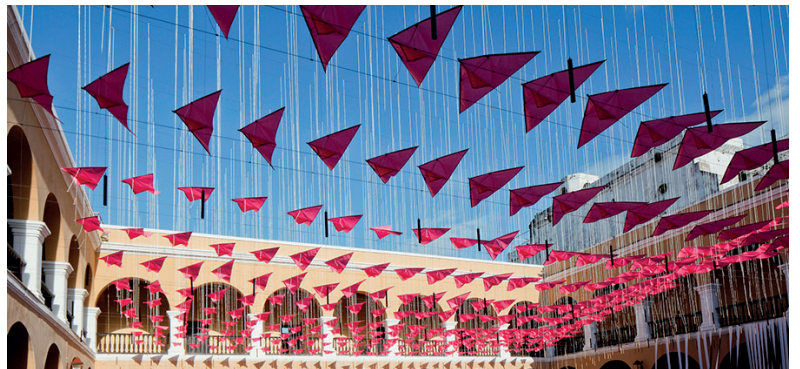
**9. In my online research, the choice of materials in connection with architecture seems to be hardly an issue; in Bruno Stagno's work, for example, the focus is more on the type of buildings/microclimate control (shadow casting, rainwater systems, etc.). What is your opinion?**

Well in Puerto Rico we mostly use concrete for construction now. Wood construction was the most common way of construction here in the late 18th/19th century. Since the 20th century concrete became the material we use the most,

## Interview

Abb. 14: REVUELO, temporary architectural installation, Design Collaboration (D. Fresse and W. Garcia), 2012

not only because of its durability, but also because it's ability to withstand hurricanes. But good wood construction are able to withstand hurricanes too and even earthquakes. That's a problem which we're having now with concrete. Some people here build their houses without the help of architects and engineers. Where the wood houses will move with the movement of the ground and probably not collapse, concrete houses might badly. It is something that we have to take in consideration. At my university, this is part of a discussion right now. Should we go back to wood constructions or shall we continue with the concrete construction? Wood needs more maintenance, you have to repaint it more often. If you don't it will rot and break. Concrete not that much. If you leave a concrete building without maintenance, it will



look run down and the layer on the outside will suffer, but it will last longer. I live in this complex which has been built 1968 and is made out of concrete basically. It has lasted because of its construction but also because of its good design. The architecture is great. So I think that is one of the things that makes it last too. The design itself is good for the long lasting of an architecture.

*What are your plans as an architect for Puerto Rico?*

I would like to come more into the Eames type of view of architecture or maybe Jean Prouvé, where architecture is mountable, is a product, where you can apply the idea of industrial design to architecture and have this systematic construction instead of building things that are grounded. Things that cannot

## Interview

be implemented to those existing grounded buildings. And how to intervene in existing buildings! Which we have a lot. We have Santurce which has all of these beautiful buildings run down. It would be great to have a project, where we can rehabilitate these buildings without building any more. I think we architects have to think about that too. We have a lot of already built buildings. So instead of building more, why don't we use what we have right now? I think that's the most sustainable way to do architecture.

**10. What went wrong with the promenade “Paseo Puerta de Tierra” that was built in 2016? Is this a typical, representative example or was it a building mistake. How would you have done it? Is it even possible to build durable buildings at this location? With which materials?**

I think this happens often. I mean first the idea of building such a heavy construction in a coastal zone was a bad idea, environmentally speaking, considering all the sediments and all the animals which live in that ecosystem, it's not responsible to do that, first of all. A promenade, where people can walk and cycle, I think that was a good idea, to have that connection within the Escambrón Beach and Old San Juan.

But they usually turn this projects into this heavy construction projects, so the architects, engineers and everyone who is connected to the government make more profit out of the construction.<sup>9</sup> Then contractors often use cheaper products then written in their bid. That's something that happens a lot here in Puerto Rico.

And then the choice of the materials... You have a corten steel, a material which is pre-rusted. It is supposed to be a controlled process where it will not rust anymore, but this does not happen all the time, especially not on this type of location. A galvanized steel would have probably worked better.

You can see it everywhere in the highways, the barriers they use here, are made out of galvanized steel and they last forever. The stainless steel they used however needs constant maintenance to keep it shiny and prevent it from rust. But if you cannot take any kind of maintenance, I think it is irresponsible to use that material. Building in a cliff like that with the concrete exposed to the soil movements, the dynamics and the rain, makes it very difficult for every construction to last. There have been made many mistakes on that construction.

<sup>9</sup> The architect fees are usually connected to the construction price, it's a percentage of the construction price.



## Interview

*So you would have made a lighter construction made out of aluminum or galvanized steel?*

Yeah, definitely. I think that would have been a better combination. That would probably compromise the aesthetics of the architect but I think you have to put that in a balance and say that a project like that should last at least 50 years not 3 years. Especially with that costs of constructions.

*It was very expensive I've been told?*

(32-38) Millions of dollars.

*Do you think it has to do with corruption?*

Yes definitely there is always a little bit of that. And also you know, making more money for less quality, that's usually what happens here. It's sad, but it's the way it goes.

In terms of architecture, I think this projects should go in competition, like they do in most states. Here you know, they usually go for the friend of a friend.

*Really!?! That's not mandatory in Puerto Rico?*

No, it's not mandatory. It's something discussed in architectural forums, but it does not happen. It's usually someone who knows somebody that gets the contracts.

**11. From an ecological point of view, it does not make sense for all objects to be made of materials that last for eternity. For which products do you see the need for action to rely on other, durable or quickly degradable, materials?**

Food containers, definitely. I feel so guilty every time I use a can of beans or something like that which is made out of metal and I have to throw it away, because there is no recyclability or anything. It's a piece of metal I have to throw into the garbage. That is something that needs to be taken into consideration faster than anything else. The food industry should change their material to something less durable and more bio-degradable.

*So you don't have any possibility to recycle cans, beer cans etc.?*

Beer cans yes - aluminum can be recycled. But the other ones, the magnetic ones no. There is no way to recycle them here in Puerto Rico. Even the aluminum is a bit difficult to get to a place where they will recycle them, because we only have very few recycle stations. We are not recycling glass anymore neither - which is really

## Interview

sad. That's why I try to buy aluminum cans for sodas or stuff like that instead of a glass version. It makes me sad every time I have to throw away a piece of glass to the garbage.

*That's crazy.*

It is. And those materials have so many possibilities.

*What happens with the waste? Do you burn it?*

We have mountains of garbage! That's actually a huge problem right now. Some people are trying to promote the idea of burning them, but it's even worse burning them, because of the atmosphere and health. It creates sickness around the places where they want to build these kind of incineration plants. It contaminates a lot.

*Well yes if you don't use the correct filter.*

Exactly and that's the case. There are these companies which are coming from the US that want to incinerate the garbage in some towns. The elected governor is pro incineration plants and there is going to be a big fight in the

next four years between the environmentalists and the current government.

**12. With regard to your own work: Which materials do you use when something does not have to be durable?**

Well, I've been experimenting



Abb. 15: TOA BAJA LANDFILL, Google Maps, Screenshot, 2020

## Interview

with the idea of using PLA for 3D printing. I think it's a material that is evolving constantly and it's getting better and better and probably in terms of the plastics and non-durable materials, I think that's an option.

I also like ceramics which is a great material for building objects and stuff like that. It also gets used for buildings. Like the New York

Times building made by Renzo Piano. The facade actually was made of ceramic rods. It's interesting because those rods control the temperature of the building. I think it would be great to see how this works here in the Caribbean as well.

I like the idea of using bamboo. I haven't used it yet because it's very expensive to buy panels out of

that. However, I try to use certified FSC Wood even if it's kind of expensive, I go for it if the product can be sold by its higher price. If not, I like pine wood because it's renewable/regrowing and can be found easily here, and further you can find it without the chemicals that usually goes into the wood.

*Okay but then I guess it gets attacked by termites instantly?*

Yes, it gets attacked by termites, that's why it is not durable. It gets eaten by insects, which I think that is great!

**13. Would you know of any specific literature about industrial design and the tropics?**

Well maybe you will! *(both laughing)* That would be great. To write a book about that. I don't think there is anything close to it. I think they are more about architecture and the tropics, but not so much



Abb. 16: NEW YORK TIMES BUILDING, Renzo Piano, Shildan Group, Esto Photographics, 2020

## Interview

about industrial design. Industrial design is kind of a new thing at the schools actually. It's very new in design schools. I haven't seen anything here, and I have checked.

*And about tropical products in general?*

No, actually if you think about design in the Caribbean furniture and stuff like that, the only person I can think of is Henry Klumb. He was a great architect but he was German. And then Duncan del Toro. He was considered the first Puerto Rican industrial designer. But I haven't seen any books about it. If I will see some... actually that's an interesting subject for the doctorate, which is something that I would like to do in the next few years, when my child grows. I would love to do a PhD with something that is related to practice

and the idea of architectural products in the Caribbean. That's something for looking at closely and study!

### **14. Is there anything else you would like to comment?**

I think we have to think about this subjects. This opens the curiosity for me to explore maybe a bit more seriously the idea of materials made for the Caribbean and to think about how that can be made. The conditions that we've talked about before, make it very difficult to build from here. The materials which come down here, and if we're going to have our products built somewhere else, how are we going to make it responsible to environmental issues? Those are the things that we have to think about from this Caribbean island. Some friends tell me, I should just pro-

duce stuff and don't think about those things. But it's really hard. Once I knew about the impacts of the products, I didn't want to be part of it. And it's hard to put that beside and say well whatever - I'm going to produce garbage.

Actually one book that I really liked and that changed my mind in many ways was „Cradle to Cradle“<sup>10</sup>. I was starting my master degree in New York when I read it and it really really made an impact in my head. The intelligence of making something that will have that sort of cycle way. That when it comes back it doesn't affect or impact the environment. I think that's the smartest way to go. To achieve it will require a lot of knowledge. A lot of resources will need to be available to be able to make it happen.

## Interview

When you approached me with this subject, I thought this is a great subject. I think about it as an aware person of what's going on but I didn't think about it in those terms - haven't thought about products for the Caribbean or made for the region, the tropics, which is a big band of ...the world. We can actually think about what we need and what can be the solution for this zone.

I always think about design from my own perspective, from the Caribbean perspective. Most objects that I make, reference to it, because that's what gives me a little bit of an edge against all of the other things that happen and get built anywhere else in the world. I think that's the beginning of something that can be expanded toward other places in the same conditions that we have here. That not many people pay attention to.

*By 2050, half of the world's population will reside in the tropics according to "State of the Tropics".*

That's interesting, wow.

That's even more interesting to think about this type of issues.

That's great.

*What do you think are the key elements regarding materials?*

I think the key is there, in the materials. For the future, mostly I think. The knowledge about how we manage to make things in a smarter way. But you know, it's hard.

*Solutions need to be found.*

Yes definitely.

**Thank you.**

## Kleine Zerfallstudie

### Ausgangslage

Vergleich dreier haushaltsüblicher Objekte. Jeweils zwei vergleichbare Konservendosen, Feuerzeuge und Gummibänder werden an einem vom Wetter geschützten Bereich im Garten deponiert. Dies geschieht zeitgleich in San Juan, Puerto Rico und Birmensdorf, Schweiz.

### These

Materialien wie Stahl, Elastomere und Hartkunststoffe, gelten in der Schweiz als langlebig und behalten ihre Qualität über Jahre. Unter tropischen Bedingungen jedoch, verändern sich die Materialien innert kurzer Zeit.

### Ergebnis

#### *Puerto Rico:*

Das Blechteil des Feuerzeugs weist nach nur drei Tagen erste Rostspuren auf. Der Hartkunststoff weist keine sichtbare Veränderung auf. Nach einem Monat ist das Gummiband von alleine gerissen. Die Konservendose beginnt nach 12 Tagen zu rosten.

#### *Schweiz:*

Keine gravierenden Veränderungen feststellbar. Das gesamte Feuerzeug sieht abgesehen von leichten Schmutzspuren aus wie neu. Das Gummiband wirkt etwas bleicher und spröder als ursprünglich. Die Konservendose inklusive Etikette sieht auch nach einem Monat im Garten aus wie frisch aus dem Laden.

### Fazit

Ein Monat reicht, um meine These grösstenteils zu bestätigen. Wie erwartet, weisen die Stahlobjekte und das Gummiband nach weniger als einem Monat Zerfallspuren auf. Dass das eine Blechstück nach nur fünf Tagen zu rosten beginnt, war hingegen sehr überraschend. Um eine sichtbare Veränderung beim Hartkunststoff festzustellen, hat ein Monat nicht gereicht.

## Small decay study

### Initial situation

Comparison of three common household objects. In each case, two comparable food cans, lighters and rubber bands are deposited in an area of the garden protected from the weather. This happens simultaneously in San Juan, Puerto Rico and Birmensdorf, Switzerland.

### Thesis

Materials such as steel, elastomers and hard plastics, are considered durable in Switzerland and retain their quality for years. Under tropical conditions, however, the materials change within a short time.

### Result

#### *Puerto Rico:*

The sheet metal part of the lighter shows the first signs of rust after only three days. The hard plastic on the other hand shows no visible change. The tin can began to rust after 12 days. After one month, the rubber band got destroyed by its own.

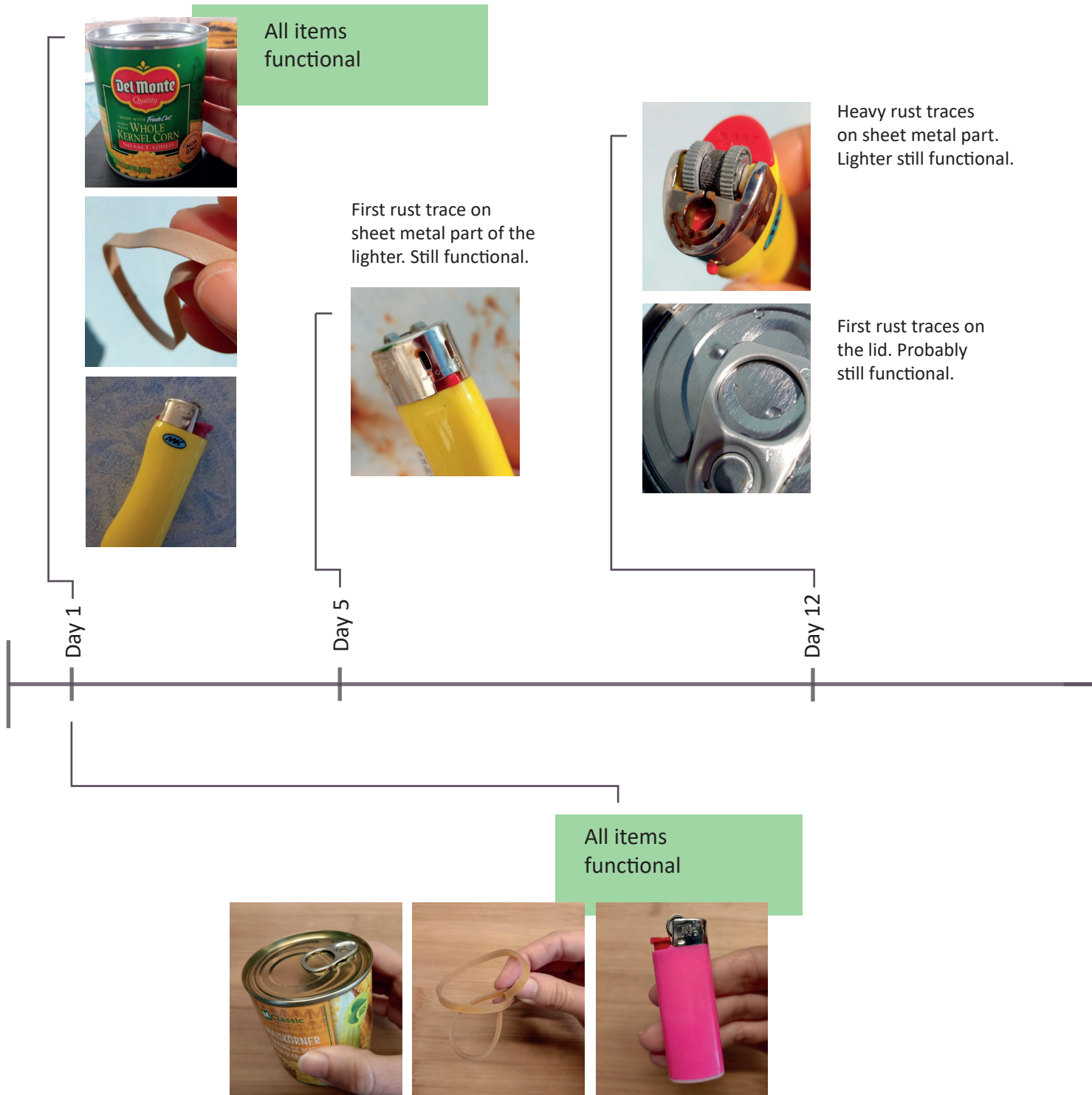
#### *Switzerland:*

No serious changes detectable. The entire lighter looks like new except for slight dirt marks. The rubber band appears slightly paler and more brittle than original. The tin can including label looks like fresh from the store even after a month in the garden.

### Conclusion

One month is enough to confirm my thesis for the most part. As expected, the steel objects and the rubber band show strong signs of decay after less than a month. The fact that the piece of sheet metal started to rust after only five days however, was very surprising to me. On the other hand, one month was not enough to detect a visible change in the hard plastic.

### Small decay study





### Small decay study

Label a little bit faded, more rust marks on the can tin. Probably still functional.



Heavy rust marks, food safety no longer guaranteed.



Strong rust traces on the tin can, colored label faded, food safety probably not given anymore.



The rubber band is partly stuck and cracked on two spots. Function not given anymore.



Strong rust marks on sheet metal part of the lighter. Plastic parts still look like new. The lighter is still working.

Day 16

Day 28

Day 33

All items functional



There are no signs of decay on the tin can and it's label. Functional.



The rubber band is elastic, dirty and maybe a bit pale. Functional.



The lighter is dirty and wet. It got back functional when dry. Functional.

## These

Vor der Durchführung der Interviews habe ich diese vier Thesen für mich aufgestellt:

1. Es müsste mehr in diese Richtung geforscht werden.
2. Die Kosten für (global tätige) Firmen wären zu hoch um resistenterer oder gar regionspezifische Produkte und Produktlinien zu vertreiben. Sie möchten kein Geld für wirtschaftlich schwache Länder investieren.
3. Möglicherweise hat die Ausbeutung während der Kolonialzeit ihren Einfluss auf den mangelnden Fortschritt in der Materialtechnologie.
4. Es wäre möglich, Produkte tauglich für das Klima herzustellen.

## Fazit

Die Interviews mit Vladimir Garcia und Doel Fresse dienen mir nun als Quelle um meine Thesen im Fazit zu überprüfen:

1. Gemäss den befragten Design-Experten, sehen sie die Langlebigkeit der Materialien in ihrer Arbeit aber auch im privaten Leben täglich als Herausforderung. Trotzdem scheinen sie sich nicht mit den damit verbundenen weitreichenden Folgen und der Bedeutung dieses Problems aus ökologischer und ökonomischer Sicht auseinandergesetzt zu haben.

Wie Doel Fresse mit seiner Aussage<sup>11</sup> „I didn't think about it in those terms (...) We can actually think about what we need and what can be the solution for this zone.“ bestätigt, war ihm nicht aktiv bewusst, dass es sich um ein Problem handelt, welches (theoretisch) gelöst werden kann.

Die Aussage Vladimir Garcias<sup>12</sup> „We don't get funded. When you

don't get money to do a research or to write, you won't get books.“ lässt besser verstehen, weshalb es keine latinoamerikanische Literatur oder öffentlich zugängliche Forschungsergebnisse zu geben scheint.

Meine Recherche hat sich nach deutsch-, englisch-, spanisch- und französischsprachigen Antworten gerichtet. Es ist nicht auszuschliessen, dass sich Wissenschaftler aus asiatischen Ländern damit befasst haben. In einem weiteren Schritt möchte ich ein Gespräch mit einem Materialwissenschaftler des Materialwissenschafts-Departement der ETH Zürich durchführen.

Ich bin der Meinung, dass ein massives fehlen (oder Unzugänglichkeit) an Wissen aber auch ein mangelndes Bewusstsein (!) besteht.

2. Gestützt auf den folgenden Annahmen, gehe ich davon aus, dass der Kostenfaktor eine bedeutende Rolle spielt:

Doel Fresse vermutet<sup>13</sup>: „(...) to make furniture durable is not convenient in many ways in a capital system like this. The finishes, the materials, everything will be more expensive. Also they want to appeal for the international market. If they would have a line for the tropics, that would be great. But they produce what will work *everywhere* instead.“

Auch Vladimir Garcia unterstützt diese These mit den Worten<sup>14</sup>: „It would clearly be awesome if such a market would be taken in consideration. But it's not like that.“

Er wirft eine damit verbundene Problematik auf<sup>14</sup>: „Even if they should (...). We are looking into an area where we have to address sustainability as a main issue for design.“

<sup>12</sup> Zitat: Auszug aus dem Interview mit Vladimir Garcia, Seite 5 (2020)

<sup>11</sup> Zitat: Auszug aus dem Interview mit Doel Fresse, Seite 31 (2020)

<sup>13</sup> Zitat: Auszug aus dem Interview mit Doel Fresse, Seite 23 (2020)

<sup>14</sup> Zitat: Auszug aus dem Interview mit Vladimir Garcia, Seite 10 (2020)

## Fazit

3. Der Einfluss der Kolonialzeit ist stärker mit der Thematik verwoben, als mir bewusst war. Puerto Rico ist speziell stark davon betroffen, doch auch hinsichtlich anderer Länder tropischer Regionen verschafft mir Vladimir Garcia Klarheit<sup>15</sup>: „With some exceptions, as for example Colombia which has a lot of specialized manufactures, pretty much everybody is on the same boat. We are in Latin America, it's a poor continent, very diminished by colonialism from day one. It's only now that we are trying to emerge, but still nations are on development and our conditions here are very limited by that in all aspects.“

4. Zur Beantwortung meiner letzten These, fehlt es mir noch an grundlegendem Materialspezifischem Wissen. Wie aus den Gesprächen und der kleinen Zerfallstudie herausgeht, sind viele alltägliche Gegenstände in der Art wie sie heute hergestellt werden, tatsächlich nicht tropentauglich.

Einige Materialien wie Glas, Aluminium, gewisse harte Kunststoffarten wie ABS und POM, Harthölzer wie Teak sowie Pulverbeschichteter Stahl sind Stoffe, aus welchen sich langlebigere Objekte herstellen lassen.

Finanzielle Mittel, Verfügbarkeit, Produktionsmöglichkeit und Knowhow sind zusätzlich not-

wendige Ressourcen, um tropentaugliche Materialien herstellen und nutzen zu können. Dabei muss auch die Entsorgungs- und Wiederverwendungsmöglichkeit dieser Materialien vor Ort berücksichtigt werden.

Mein längerfristiges Ziel ist es, eine Auflistung geeigneter Materialien und Materialbehandlungen zu tropentauglichen Stoffen aufzustellen. Dazu möchte ich Materialforschungen verfolgen und betreiben sowie mich mit der möglichen Wiederverwendung und Entsorgung der Materialien vor Ort auseinandersetzen.

<sup>15</sup> Zitat: Auszug aus dem Interview mit Vladimir Garcia, Seite 15 (2020)

## Fazit

Auszug aus dem Interview  
mit Doel Fresse, Seite 31 (2020)

5. In der Einleitung habe ich die Frage was bereits über die Problematik bekannt ist und was aufgrund dieser Einsichten geschah, aufgeworfen.

Bekannt ist, dass sich die Geschwindigkeit chemischer Reaktionen pro 10 Grad Temperaturunterschied verdoppelt. Ein Prozess, der unter Feuchtigkeit zusätzlich begünstigt wird, würde unter trockenen Bedingungen sehr langsam oder gar nicht ablaufen.<sup>16</sup> Auch Sonneneinstrahlung beschleunigt viele chemische Veränderungen,

«

*What do you think are the key elements regarding materials?*

**I think the key is there, in the materials. For the future, mostly I think. The knowledge about how we manage to make things in a smarter way. But you know, it's hard.**

*Solutions need to be found.*

**Yes definitely.**

»

besonders wenn die Strahlung im hochenergetischen kurzwelligen Sonnenspektrum liegt<sup>17</sup>, was in Regionen am tropischen Gürtel der Fall ist.

Diese Erkenntnis scheint in der Industrie und Produktion von Konsumgüter erstaunlich wenig Beachtung zu erhalten.

<sup>16</sup> Deterioration of materials under tropical conditions, T. L. Webb, J. H. P. van Aardt, S. 260 (1959)

<sup>17</sup> Deterioration of materials under tropical conditions, T. L. Webb, J. H. P. van Aardt, S. 260 (1959)

## Thesis

Prior to the interviews, I proposed the following four theses:

1. More research needs to be done in this field.
2. The costs for (globally active) companies would be too high to sell more resistant or even region-specific products and product lines. They do not want to invest money for economically weak countries.
3. Possibly the exploitation during the colonial period has its influence on the lack of progress in material technology.
4. It would be possible to manufacture products suitable for the climate.

## Conclusion

I try to verify my theses by referring to the interviews with Vladimir Garcia and Doel Fresse:

1. According to the design experts interviewed, they see the longevity of materials in their work but also in their private lives as a daily challenge. Nevertheless, as it seems, they did not address the problem's far-reaching consequences associated and the importance of this problem from an ecological and economic point of view.

As Doel Fresse confirms with his statement<sup>11</sup> „I didn't think about it in those terms (...) We can think about what we need and what can be the solution for this zone.“, he was not actively aware that this is a problem that can be (theoretically) solved.

Vladimir Garcia's statement<sup>12</sup> „We don't get funded. When you don't get money to do research or to write, you won't get books.“ makes it easier to understand why there seems to be no Latin American literature or publicly available research results.

My online research has looked for German-, English-, Spanish- and French-language responses only. It cannot be excluded that there are papers available offline or written in other languages. As a further step, I would like to interview a materials scientist from the Materials Science Department of ETH Zurich.

I believe that there is a massive lack (or inaccessibility) of knowledge but also an immense lack of awareness (!).  
2. based on the following assumptions, I assume that the cost

factor plays a significant role: Doel Fresse assumes<sup>13</sup>: „(...) to make furniture durable is not convenient in many ways in a capital system like this. The finishes, the materials, everything will be more expensive. Also, they want to appeal to the international market. If they would have a line for the tropics, that would be great. But they produce what will work, everywhere' instead.“

Vladimir Garcia also supports this thesis with the words<sup>14</sup>: „It would clearly be awesome if such a market would be taken into consideration. But it's not like that.“

He raises a related issue<sup>14</sup>: „Even if they should (...). We are looking into an area where we have to address sustainability as a main issue for design.“

<sup>11</sup> Quote: Excerpt from the interview with Doel Fresse, page 31 (2020)

<sup>12</sup> Quote: Excerpt from the interview with Vladimir Garcia, page 5 (2020)

<sup>13</sup> Quote: Excerpt from the interview with Doel Fresse, page 23 (2020)

<sup>14</sup> Quote: Excerpt from the interview with Vladimir Garcia, page 10 (2020)

## Conclusion

3. The influence of the colonial period is more interwoven with the theme than I realized. Puerto Rico in particular is strongly affected, but Vladimir Garcia also gives me clarity concerning other countries in tropical regions<sup>15</sup>: „With some exceptions, for example, Colombia which has a lot of specialized manufactures, pretty much everybody is on the same boat. We are in Latin America, it’s a poor continent, very diminished by colonialism from day one. It’s only now that we are trying to emerge,

but still, nations are on development and our conditions here are very limited by that in all aspects.“

4. To answer my last thesis, I still lack basic material-specific knowledge to come to a proper conclusion. However, as can be seen from the interviews and the small decay study, many everyday objects in the way they are produced today are indeed not suitable for being used in tropical regions. Some materials such as glass, certain hard plastics such as ABS

and POM, hardwoods such as teak, and metals such as aluminum or (powder-coated) steel are basic materials from which durable objects can be made.

Financial resources, availability, production capability, and know-how are additional necessary resources to be able to produce and use tropicalized materials. The disposal and reuse of these materials must also be taken into account locally.

<sup>15</sup> Quote: Excerpt from the interview with Vladimir Garcia, page 15 (2020)



## Conclusion

My longer-term goal is to compile a list of suitable materials and material treatments for tropicalized materials. To do this, I would like to pursue and conduct materials research and address the potential reuse and disposal of the materials in the field.

5. in the introduction I raised the question of what is already known about the problem and what happened because of these insights. It is known that the speed of chemical reactions doubles for every

Excerpt from the interview  
with Doel Fresse, page 31 (2020)



*What do you think are the key elements regarding materials?*

**I think the key is there, in the materials. For the future, mostly I think. The knowledge about how we manage to make things in a smarter way. But you know, it's hard.**

*Solutions need to be found.*

**Yes definitely.**



10 degrees difference in temperature. A process that is additionally favored under humidity would proceed very slowly or not at all under dry conditions.<sup>16</sup> Solar radiation also accelerates many chemical changes, especially if the radiation is in the high-energy short-wave solar spectrum,<sup>17</sup> which is the case in the tropics.

This knowledge seems to receive surprisingly little attention in the industry and production of consumer goods.

<sup>16</sup> Deterioration of materials under tropical conditions, T. L. Webb, J. H. P. van Aardt, page 260 (1959)

<sup>17</sup> Deterioration of materials under tropical conditions, T. L. Webb, J. H. P. van Aardt, page 260 (1959)

## Zentrale Begriffe

### *Commonwealth*

Der Begriff „Commonwealth“ beschreibt in diesem Fall die Beziehung zwischen den Vereinigten Staaten und Puerto Rico. Seit 1952 ist Puerto Rico ein Commonwealth der USA, also ein nicht inkorporiertes US-amerikanisches Aussengebiet. Der Status wird jedoch von der UNO seit den siebziger Jahren als Kolonial kritisiert.

### *langlebig*

Für lange Zeit funktionstüchtig, gebrauchsfähig

### *Tropen*

Gebiete beiderseits des Äquators (zwischen den Wendekreisen) mit ständig hohen Temperaturen.

## Eigenständigkeit

Hiermit versichere ich, dass ich die vorliegende Arbeit selbständig und ohne fremde Hilfe angefertigt habe. Alle Stellen, die ich wortwörtlich oder sinngemäss aus öffentlichen oder nicht öffentlichen Schriften übernommen habe, habe ich als solche kenntlich gemacht.

Zürich, 09.01.2021



Meret Jans

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